



FRIDAY, MAY 4.

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Contributions.

Adhesion and Friction—A Correction.

TO THE EDITOR OF THE RAILROAD GAZETTE:

There are a couple of pen errors in my communication on this subject in your issue of April 20, page 247, one of which reverses my intended meaning. The words "the co-efficient of" should be stricken from the sixth line of the first paragraph. The other error is unimportant. Both were in copy.

G.

Six-hole Angle Splices.

Michigan Central Railroad Co.,
Chief Engineer's Office,
DETROIT, Mich., April 27, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

As considerable attention appears to be directed just now to the six-hole angle splice, it may be of interest to railroad men to know what experience we have had on the Michigan Central with the six-hole splice.

When we adopted it many railroad men considered the three holes in the rail a source of weakness. While I did not anticipate any trouble from the extra holes, still I did not claim the drilling of these holes would materially decrease the breakage of rails at the bolt holes, but such has been our experience.

In 1885, 1886 and 1887 we laid 255 miles of main track, with the six-hole splices. On this mileage we have had only one rail break at the bolt hole and that was at the first bolt hole instead of the third. In my experience I have never known so favorable a record for an equal length of track.

The long splices break very much less with us than the short splices, the breakage on well ballasted track being practically none.

J. D. HAWES,
Chief Engineer.

Fuel Consumption in Car Heating.

CINCINNATI, April 30, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your editorial on the last meeting of the New England Club you speak of the remarkable lack of exact data on steam heating of cars. This complaint is quite just, and there is little doubt but that the continuous heating companies have made a mistake in contenting themselves with general statements as to the certainty and economy of their methods.

One concern at least, the Sewall, realizes this, and is now making exact experiments on the subject to determine, not the possibility of heating cars, which is of course already granted, but to find the comparative values of steam, coal and gas in their combination heaters, and to determine just how long a time exact quantities of each will take to do their work. These experiments will be fully reported and discussed later, and as they are being made in such a way as to secure practical and impartial results, they will be of great value to all parties interested in the matter of continuous heating.

Professor Lanza, in his study of the subject, made an attempt to do this, but, like most men who deal too exclusively with theoretical matters, he overlooked some important details, and his results are therefore of comparatively little value. An examiner who requires that not a drop of water should escape the couplers ought at least to take some notice of the character and size of the cars heated, the condition of the ventilators, etc., particularly when the coaches experimented on are—at least locally—reputed unusually large, open and hard to heat.

The Professor's facts are all quite favorable to continuous heating, when carefully analyzed, but it is unfortunate that the results of an "impartial" observation should be presented just as these were, and doubly so when, as in this case, all discussion of them was prohibited.

JOHN B. PORTER.

Tie Plates.

Intercolonial Railway of Canada.
Office of the Chief Engineer,
MONCTON, N. B., April 23, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring again to your letter of the 10th instant in regard to our experience with the Servis tie plate, I have to

say that we have had about six miles in use for four years, and about 40 miles in use for about one year.

The first six miles laid were of iron, and were $7\frac{1}{2}$ in. long, $2\frac{3}{4}$ in. wide, $\frac{1}{8}$ in. thick, with a flange $\frac{1}{4}$ in. deep. Those ordered last year were of steel, 8 in. long, $3\frac{1}{4}$ in. wide and $\frac{1}{4}$ in. thick, and much stiffer than those first used. The first lot were rather light, and were not bedded very carefully; they bent up slightly at the ends. They have, no doubt, preserved the life of the ties.

Cedar ties are used for about 400 miles on the northern divisions of our road. It is the most durable wood we have as far as affected by the weather. A cedar tie will probably last from 15 to 20 years if not cut through by the wear of the rails and the repeated driving of the spikes into it. The tie plate prevents the wearing of the ties by the rails, but does not prevent the sleepers from being cut up by spikes; the wood being soft, there is a tendency for the spikes to work loose.

From year to year we are taking up our 56-lb. rails and replacing them with rails 67 lbs. to the yard. The heavy rails we are laying down have a base half an inch wider, and consequently the tie plate suitable for the 4 in. rails is not suitable for the $4\frac{1}{2}$ in. This is the chief reason we have not used more of them.

The new plates laid about a year ago have done better than the old ones where they are properly laid. On curves particularly, it is much easier to keep the track in line and to gauge with them than without them, and they effectually prevent the rails from canting on the curves, which in many places has given us considerable trouble.

I may tell you that our cedar ties only cost us from 12 to 14 cents each, and the tie plate to preserve them is not so much an object to us as it would be with many roads in the United States where the same cedar ties cost from 35 to 45 cents each.

I note your editorial remarks on "American Genius" letter in the *Gazette* of the 13th inst. As far as our experience goes the noise is not objectionable. When sitting in a car passing the over track, it is impossible to say where the plates are used and where not. This might not be the case where other than cedar ties are used. The other point raised by you seemed to me the most objectionable feature of the device when it was first introduced. In practice, however, we have not experienced any difficulty. The two spikes acting together would, it appears to me, more than compensate for the tendency of the rails to slip on the tie plate.

P. S. ARCHIBALD, Chief Engineer.

Transportation of Immigrants.

PHILADELPHIA, April 30, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am glad to see that you have an eye to the troubles of the poor immigrants, as is shown by your editorial of April 27, but I am somewhat doubtful about your remedy. You say that a passage to Chicago costing, say \$8, should be charged for at the rate of \$13 and the profit used for improving the facilities; but in the same breath you say that the immigrant does not appreciate improved facilities. If that is the case, why not reduce the price?

I admit that some of the money could be used for improving the cars so that the poor, tired immigrants could get some sleep on their weary journey, and for providing better waiting rooms and more comfortable transfer through the cities, but the most of the money would have to go for indivisible expenses, such as interlocking signals and abolition of grade crossings. Is it fair to make the immigrant, who is going west to stay, pay such a large share of the cost of improvements of this latter kind? You say it is fair for a railroad to carry passengers at an unreasonably low profit because the same passengers have to make it up to the road on the food, clothing, etc., they consume, which has been transported over the road a relatively high profit; but it seems to me that this rule is a very crude one. Take the case of the New York Central with its immense export traffic; is not the European consumer of bacon and cheese paying an undue share of the expenses of the road to enable it to carry local passengers too cheaply?

Consumers in Europe and immigrants for the west are not fairly a portion of the "community" served by the New York Central. But whatever may be the right of these questions, common humanity demands that the plain and comfortable immigrant sleeping cars used by the roads west of Chicago be introduced on the eastern roads. To make women and children ride 36 or 48 hours, or even more, in "sitting-up" cars is barbarous, especially as it is unnecessary. The old passenger cars now used for immigrants could be cheaply fitted up and without spoiling them for day travel. This would be a "facility" which the most ignorant foreigner could appreciate.

H. T. C.

[An immigrant will appreciate good facilities while he is on the journey. Of that we never had any doubt. The question is whether he will appreciate them when he is buying his ticket. In the great majority of cases we think he will not. A dollar's difference in present expense by one route will count for more than two dollars' difference in probable comfort by another. The result necessarily is that active competition for immigrant business sacrifices every other consideration to that of mere cheapness. Now, if the condition of the country were such that it was desirable to attract the lowest grade of immigrants by mere cheapness of rates, something could be said in favor of such a system. But such is not the case. It is a general

feeling that low-grade immigrant traffic needs to be checked rather than stimulated. If this feeling is justified, considerations of public policy demand that immigrant rates should be relatively high. We are not talking of questions of distributive justice between different classes of people who use the road, but of the interests of the American public as a whole. We believe that these will be much better subserved by high immigrant rates and good facilities, rather than by low immigrant rates and cheap facilities; so much better, that it is worth while to let the railroads make a large profit—disproportionately large, if you please—under the former system, instead of a small one under the latter.—EDITOR RAILROAD GAZETTE.]

Interlocked Switches and Signals.

BY CHARLES R. JOHNSON, C. E.

I.

In the *Railroad Gazette* of Nov. 20, 1885, was published a table showing the number of interlocking plants then in use in the United States. At that time there were in operation some 227 machines aggregating 2,659 levers. Since that time great progress has been made in the use of interlocking, and it is our purpose in this and some succeeding articles to show what has been done, not only in the addition of interlocking plant, but in modifications of practice. It is well, however, to state at the outset some general facts which are well known to a few, but are not so generally understood as they should be.

Generally speaking it may be said that wherever there is any doubt as to the practical value of interlocking or block signaling it is due either to defective appliances or want of proper maintenance, and chiefly to the latter cause. The reason for this is easily explained. A railroad company in introducing such a new system is almost certain to be without employees familiar with the use and maintenance of the numerous parts used in signaling appliances. This trouble is being remedied on several roads by the appointment of men whose sole duty is to take charge of signals. Signal departments are being created, in fact. The drawback in many cases, however, is that men are put in charge who have had no previous experience of the subject, and no reflection is made on their intelligence in saying that it is impossible for them to at once become competent to superintend maintenance, and still less so to design and execute plants. It is generally supposed that the art of signaling is very simple, and can be easily and quickly acquired; but those railroad officers who have gone into the matter most deeply, and have had the most work done, will bear us out in the statement that the more they look into the matter the more there seems to be to look for.

In interlocking the principle is indeed simple. It is that at all points of danger to traffic by the use of switches, which take trains from one track to another, such as at junctions, sidings and terminals, and also at grade crossings, where there are no switches, visible signals shall be displayed on all tracks requiring them, and that they shall be worked in such a way that conflicting signals cannot be given at the same time. For instance, at a single track junction we must insure, not only that signals for the converging tracks, or those being used in the trailing direction, shall not be given at the same time, but also that the switch shall be set for the track for which the signal is to be lowered, so as to prevent its being run through and probably broken, and also that the switch cannot be turned again until the signal has first been placed to danger. For trains using the junction in a facing direction the switch must be not only in its proper position for the corresponding signal, but also locked in that position to prevent the possibility of having a clear signal and a partially closed switch. The lock also must have connected with it a detector bar of sufficient length to prevent an operator from first throwing his signal to danger and then moving his switch while the train is passing over it. All railroad men will understand how easy it is without a detector bar to move a switch between cars, or between the wheels of a car. Although, therefore, the principle is simple and easily understood, it is much more difficult to understand the details of an interlocking apparatus, the proper positions of signals, the most suitable kind of signals for various purposes, the best and most economical connections for signals, switches and locks, the means for counteracting the varying length of the connection caused by variations of temperature and the best general lay out for complex yards or stations.

One great difficulty of the signal engineer is to convince officials that partial interlocking is almost as bad as permissive block, for the reason that the men to be governed by one or the other are apt to think that they have complete protection when it is only partial. In a word, they rely partly on a system and partly on the exercise of their own judgment, and the result is often disastrous. The chief reason why partial signaling is so often done is that it is not considered necessary to signal movements that are not often made, and as the danger is not understood, the signaling is cut down and the first cost saved at the expense of greater cost eventually. It is often considered not necessary to give a fixed signal for using a grade crossing in the wrong direction, or for backing through a cross-over, or from a junction in the face of traffic, or into a siding, because main track signaling are supposed to be enough. Plans for partial signaling have frequently been prepared and the work executed, with the result that in many cases railroad companies thought themselves in a measure imposed upon because they found they had not attained absolute perfection. A more careful

examination of the plans at the outset would have prevented this misunderstanding. It is gratifying, however, to know that several important roads now insist upon interlocking being complete wherever it is put in; that is, that a signal shall be given for every traffic movement that can be made. Wherever this is done interlocking is appreciated as it can be in no other way.

As a rule, the proper signaling and interlocking of any given point requires more study in its design and more time in its execution than is commonly thought necessary, and probably managers do not often give it the necessary attention, but are constrained to leave to the expert more responsibility than he can fairly assume. This can only be an entirely successful way of dealing with the problem if the expert is thoroughly competent and is allowed to prepare his own plan of tracks after obtaining full particulars of present and probable future traffic movements, and can decide what money is to be expended, but this can seldom be practicable.

To get a notion of the time which must almost inevitably be consumed in executing any comprehensive scheme of interlocking let us consider the case of a division to be equipped, with ample appropriation of money, and every officer of the company ready to facilitate the work. The first work is to fix the location of the towers, and this may often involve the purchase of land. The towers located and designed, the design, construction and erection will follow with such rapidity as circumstances permit, but even the distribution of the material for a number of towers, under the most favorable circumstances, over a division crowded with traffic, is a work of considerable time and trouble, particularly where there is no officer familiar with the work, whose sole duty it is to look after it. Only after the location of the tower has been settled can the working plans be prepared for the signaling, and when these are made they have to be sent to an inspector who takes them to each point and reports as to the best run of connections, the location and height of signals and other particulars necessary in ordering material. While considerable material can be carried in stock the interlocking machines and most of the signals have to be made specially. When material has been made, shipped and arrived at its destination men may be sent to do the erecting. This is one of the most important parts of the business; for no matter how excellent the design may be or how well manufactured, unless the parts are properly fixed the finished signaling shows poor results. It may seem an easy matter to overcome the difficulties in the way of doing quick work, and it would be so if they were better understood, as they are certainly becoming on many roads. Delays are costly and can only be avoided by having everything in readiness for the execution of the work. This is a matter which depends almost entirely on railroad officers. Innumerable delays result from a want of knowledge of the business. Erecting men are often sent on the ground prepared to commence work, and then it is found that the tracks have to be moved, new switches and frogs put in, some drainage to be done, signal bridges to be built, and so forth, all of which should be done before the interlocking men arrive on the ground.

Street's Highway Crossing Signal.

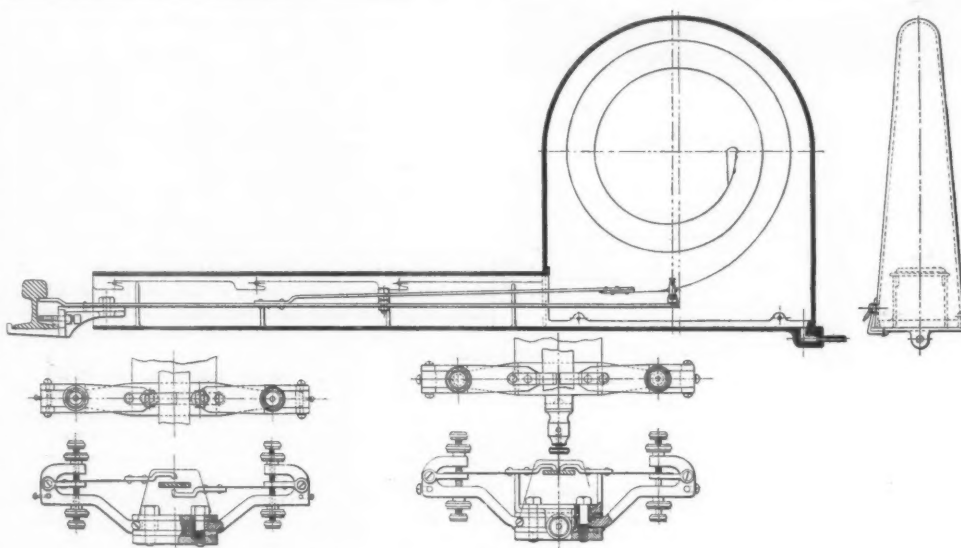
The illustrations given herewith show a device for operating an electric circuit for the purpose of ringing a bell at a highway crossing to warn teams and pedestrians of the approach of a train. The cut shows side and end sections of the track instrument, and plans and sectional views of the circuit breaker and cut-out. The lower left-hand figure shows the circuit breaker,* which is fastened to the horizontal steel spring (shown in the larger figure) at its end furthest from the track, an insulator block placed between them keeping them electrically separate. The lower right-hand figure shows the cut-out, similar in principle to the circuit breaker, which is placed at the point of danger (as a road crossing) to stop the ringing of the bell the instant the train has passed it.

The first track instrument closes the electric circuit and keeps it closed (ringing the bell) such length of time as may be desired. The cut-out, actuated by the train as it passes the crossing, opens the circuit (preventing the ringing of the bell). This is used on single track roads and is adjusted to keep the circuit open until the train shall have passed the circuit breaker on the other side of the crossing, which, of course, should be operated only by trains moving in the opposite direction.

The principle of the operation of the circuit breaker is very simple, as will be seen by the cuts. A flat horizontal steel spring is fixed to a bracket, clamped to the under side of the rail, and extends out about 5 ft. at right angles to the track. The inner end of this spring or lever presses against the under side of the rail head, and is adjusted so that the jar of the train imparts considerable motion to the far end, the fulcrum being about 6 in. from the rail. The vibrations of the lever cause the circuit breaker fastened to, but insulated from, its outer end to move vertically.

At a point about one-third of the length of the lever, measuring from the rail, is mounted on it a similar but smaller vibrating arm, which has mounted on its outer end a large coiled brass spring, which passes between the contact points of the circuit breaker, and in its normal position rests between and entirely free from contact with either of them. The contact springs of the circuit breaker are electrically connected. One pole of the battery being connected with the coiled brass spring the circuit is permanently broken while the circuit closer is at rest. The jar of a train on the rail sets the large coiled spring in motion, this causes the two vibrat-

*"Circuit breaker" is a misleading term, as the effect of the action of the instrument is to keep the circuit closed (not broken) while it is in operation.



STREET'S HIGHWAY CROSSING SIGNAL.

ing rods to work alternately against each other, causing the arm of the coiled spring to strike rapidly against the contact points of the small contact springs on the insulator block, each contact closing the circuit, thus ringing an alarm at a distant point.

As the train passes more or less rapidly over the track, the recoil of the brass spring becomes more pronounced, and continues its motion long enough for the train to reach the point of danger, when it ceases striking the points which close the circuit, and the alarm stops sounding, the time being graduated by the distance the contact points are adjusted above and below the arm of the coiled brass spring. As the spring ceases its motion the vibrating rods come to a state of rest, and the circuit is permanently broken. The device can be so constructed and adjusted that it will ring an alarm from a few seconds to 10 or 15 minutes or more, and ring continuously while a train is running a distance of a few rods to a number of miles. It will be seen that the device is secured to the bottom of the rail in such a manner that no wheel strikes any part of it.

The advantages claimed are: Cheapness—The cost of manufacture not exceeding \$5. Efficiency—"It never makes a false alarm or fails to give an alarm at the proper moment." Durability—It is made very strong and no train or car can injure it except by derailment. Cheapness of maintenance—This being practically confined to keeping the battery in order. It is not affected by the weather, and works equally well throughout all seasons of the year. Should a train stop over it, it stops its motion and causes the alarm to cease. When the train starts it instantly begins sounding an alarm at the point of danger. It is a perfect annunciator for draw bridges, from station to station or between stations from a single block, or a series of blocks, as the train runs from one to another.

This signal has been used for some time on the New York, Lake Erie & Western, and we understand has been adopted as the standard of the company. It is also in use or to be tried on the Old Colony, Boston & Providence, New York, Ontario & Western, Pennsylvania, New York & Northern and New York, Chicago & St. Louis. The inventor and owner is Rev. S. T. Street, Deposit, N. Y.

Maintenance of Track, and the Steel Rail in Track Economy.

BY JOHN M. GOODWIN.

In a late equity suit, between two railroad companies, in which I was a witness, each party presented "expert" testimony relative to the cost of maintaining railroad track per mile per year. The plaintiff, seeking to enforce upon the defendant the building and maintenance of a certain projected branch railroad, represented the cost of maintenance as a merely nominal charge. His witnesses were not unanimous, by any means, as to just what the cost would actually be; but the highest estimate was very much below the lowest put in by the defendant, who wished to avoid building the branch in question.

Here were several "experts" on one side, giving testimony regarding this matter of annual cost of maintenance of track, largely contradicting that of about an equal number on the opposing side. The Master in this case, and in like cases, in treating details regarding which testimony such as that above described has been given, might, perchance, hit somewhere near the truth by "splitting the difference" between the opposed statements, but he might better say, simply, that the statements are irreconcilable, and that the testimony as a whole affords no satisfactory evidence in any matter at issue.

In a review of the case alluded to I have, for the purpose of illustrating some general principles, made an exhibit exemplifying actual cost of maintenance of the tracks of a railroad in the periods from 1873 to 1878, both years included; and from 1880 to 1884, both years included. The road on the accounts of which the exhibit is based (the Lake Shore & Michigan Southern) has considerably more than 2,000 miles of track, all told; of which main line tracks (including second track) constitute about 37 per cent., branches about 36½ per cent., and sidings and yard-tracks about 26½ per cent. of

the whole. It is centrally situated, and does a general business; no particular traffic largely predominating.

I show as nearly as I can from the data supplied by the published reports of the company (which are more explicit than any others within my knowledge) the progress of substitution of steel for iron rails in the main line tracks; and generally give all details, deducible from the reports, which seem to me useful as means for making a fair estimate of cost of maintaining in good order, under an ascertained traffic in the region in which the L. S. & M. S. road lies, a first-class steel-rail track, with its road-bed. My examination of the matters treated has been directed so as to illustrate, as far as I might with the means at hand, the value of the steel rail in railroad economy. In furtherance of the ends had in view, I submit the subjoined tables and notes:

Miles main line and second track.....	Miles branches.....	Miles all tracks and sidings.....	Miles steel track.....	Per cent. of steel in main line.....	Per cent. of steel in branches.....	Per cent. of steel in all tracks aggregated.....	Per cent. of steel in main line and branches aggregated.....	Per cent. of steel in sidings.....
'73 770.36	640.39	1,799.30	413	53.61	.....	29.2	23	.....
'74 771.17	635.02	1,835.41	514	66.65	.....	36.5	28	.....
'75 771.17	635.02	1,835.89	604	78.32	.....	42.9	32.6	.....
'76	about 1,863.89	683	88.29	.....	48.57	36.3	.....	.....
'77 776.02	636.43	1,574.88	843	all—66.98 m.	10.52	59.6	45	.....
'78 776.02	636.43	1,577.84	1,002	all—225.98	35.5	70.9	58.3	.....
'80 788.65	636.33	1,892.37	1,125	all—336.35	52.55	78.9	59.3	.....
'81 806.73	636.33	1,946.66	1,238	all—431.27	67.77	85.5	63.6	.....
'82 806.73	799.05	2,142.38	1,361.5	all—554.77	69.48	84.8	63.5	.....
'83 806.73	799.05	2,150.88	1,440.83	all—634.1	79.35	89.7	67.0	.....
'84 806.73	799.05	2,154.59	1,521	all—714.27	89.29	94.6	70.6	.....
'85 806.73	799.05	2,155.82	1,505	all—738.27	98.57	99.27	73.98	.....
'86 806.73	799.05	2,161.49	1,674	all—867.27	all—67.41 m.	13.05	77.67	.....
'87 806.73	800.89	2,199.30	1,734	all—927.27	all—126.88 m.	21.68	79.16	.....

COST OF MAINTENANCE OF TRACK.

Total miles track.....	Gross cost of maintenance, including bridges.....	Cost per mile, including bridges.....	Cost per mile exclusive of bridges.....
1873.... 1,799.30	\$3,765,219	\$2,093	\$2,051
1874.... 1,835.41	2,344,982	1,278	1,246
1875.... 1,852.89	2,483,637	1,340	1,304
1876.... 1,874.89	1,805,058	965	905
1877.... 1,874.89	2,011,788	1,073	984
1878.... 1,877.84	1,491,665	794	701
1880.... 1,892.37	1,572,614	831	717
1881.... 1,946.66	1,805,434	927	856
1882.... 2,142.38	1,946,423	909	852
1883.... 2,150.88	1,789,317	833	772
1884.... 2,154.59	1,326,957	616	565

In the period 1873-1878, both years included, the average annual cost of maintenance of track (including bridges), per mile of track, was \$1,250.75; exclusive of bridges, \$1,198.48.

In the period 1880-1884 (both years included) the average annual cost of maintenance, including bridges, culverts and cattle guards, was, per mile, \$821.55; exclusive of bridges, culverts, etc., per mile, \$752.39.

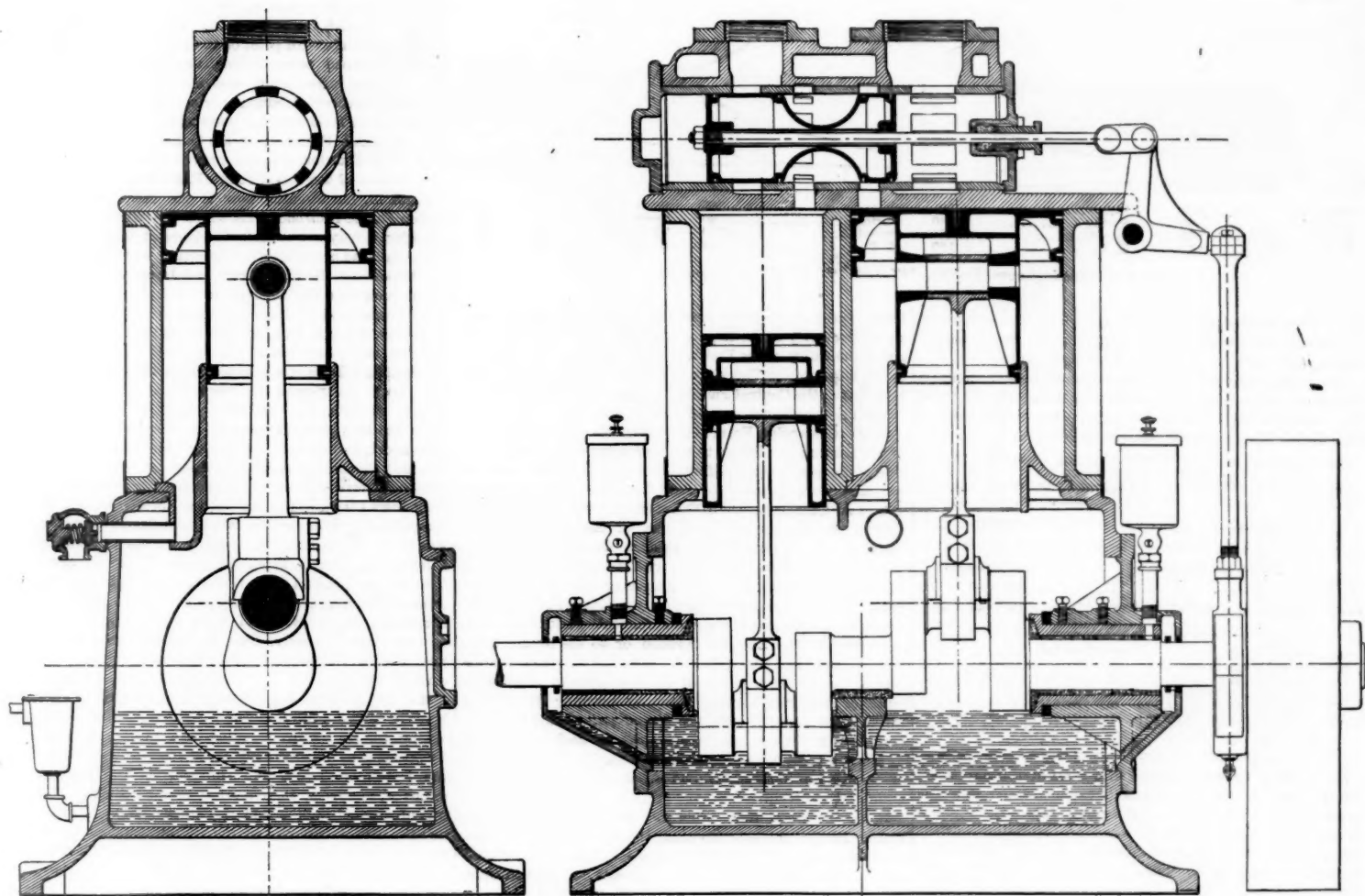
In the period 1873-1878 the per cent. of steel track to road tracks (i. e., all tracks except sidings and yard tracks), averaged 47.94. In the period 1880-1884, averaged 86.76. Increase (in percentage), 38.82.

The average annual cost of maintaining track per mile (including bridges, etc.) in the period 1880-1884 was 34.32 per cent. less than in the period 1873-1878; exclusive of bridges, etc., it was 37.22 per cent. less than in the period 1873-78.

The average annual ton-mileage in the period 1880-1884 was 26 per cent. greater than in the period 1873-1878.

The average total mileage of track for six years, 1873-1878, was 1,850.7 miles, and for five, 1880-1884, it was 2,057.37 miles. Increase of annual average, 206.67 miles, or about 10.1 per cent.

The average annual gross expenditure for maintenance of



THE WESTINGHOUSE AUTOMATIC COMPOUND ENGINE.

track, including bridges, culverts, and cattle guards for the period 1880-1884, was \$1,688,149, or about 27.2 per cent. less than that of the period 1873-1878; which (including bridges only), was \$2,317,055 per annum.

The average annual gross expenditure on track, exclusive of bridges, etc., was for the period 1873-1878, \$2,208,508.60; and for the period 1880-1884, \$1,542,952.07, or about 30.14 per cent. less.

The difference between decrease of annual gross expenditure on track (exclusive of bridges, etc.) in the period 1880-1884, and decrease of expenditure per mile in the same period, is (as seen) 7.08 in the percentages; the decrease being the greater in the expenditure per mile, the average annual gross expenditure having been kept at higher figures by the increase of total mileage of track.

The fact that decrease of cost of maintenance of track per mile has, since 1873, quite regularly followed each increase of the per cent. of steel in the tracks of the road, the experience of which we are tracing, is not, however, to be taken as conclusive evidence that the decrease of cost aforesaid is referable to the introduction of steel instead of iron rails.

We must note that, while the average annual cost of maintaining track per mile (exclusive of bridges, etc.), was in the period 1880-1884 less than in the period 1873-1878, by 37.22 per cent., the average price of steel rails was in the 1880-1884 period 34½ per cent. less than in the 1873-1878 period; and that spikes which cost 7 cents per pound in 1873 cost only 2½ cents per pound in 1884.

See the subjoined tabulated statement of prices:

	Steel rails per ton average.*	Iron rails per ton average.*	Spikes per pound.	Track bolts per pound.	Splice bars per pound.	Ties.
'73.	\$121.25	\$77.00	as high as 7c.			av. abt. 50c.
'74.	96.50	58.60				
'75.	71.00	47.40				
'76.	58.60	41.20				
'77.	51.00	36.00				
'78.	44.20	29.40				
'79.	46.00	45.20				
'80.	60.00	47.80	2½@2½c.	2½c.	2c.	
'81.	53.60	48.50				
'82.	51.90		2.9@3¼c.	3¼@4¼c.	2.4@2.8c.	
'83.	39.30		2.6c.	3¼c.	2@2.1c.	
'84.	2.00		2.5c.	2.6@3c.	1.6@1¼c.	Cost tie and ave. 40c.

* Highest price steel rails in 1873 = \$123.00. Iron rails = \$85.00.

The price of steel rails for the period 1873-1878 averaged \$78.76 per ton; iron rails, \$49.18 per ton. Average price of steel rails, 1880-1884, was \$48.45 per ton, and of iron rails, 1880-1884, \$47.16 per ton. The steel rail price in 1880-1884 was 34½ per cent. less than in the period 1873-1878.

RENEWALS OF RAILS.

	Steel rail put in. Tons.	Reroiled iron put in. Tons.	Repaired iron put in. Tons.	Miles of track.	Per cent. of main line.	Per cent. of entire track.
1873	14,234*	13,633*		149.78	19.4	
				142.14		20.3
	7,690†		6,941	73.65		
1874		5,383		81.08	10½	
			9,528	56.07		13.0
1875	9,982.5			104.87	13.6	
		11,071.76		117.41		17¼
	10,500		9,168.41	97.24		
1876		1,360		111.68	14.48	
	15,080		4,721	13.35		10.0
			160.17	59.83		
1877		786		8.34		11.35
			4,186	44.40		
1878	10,194	306		107.33	13.8	
			2,477	3.21		7½
				27.12		
1880			about	135		7
1881	10,765			105.40	13.06	
		291		3.09		7
	11,216		2,274	24.11		
1882				109.81	13.61	6.8 of main line and branches.
		2,479		26.29		6.35 of all tracks.
1883	11,004			107.73	13.35	6.7 of main line and branches.
		3,251		34.48		6.61 of all tracks.
1884	8,135			79.65	9.87	5 of main line and branches.
		1,912		20.20		4.6 of all tracks.

* Steel includes 771 tons "silicon" steel.

† Iron includes some new rails.

‡ Includes 290 tons "silicon" steel.

The average annual renewal of all tracks in the period 1880-84 was 46.9 per cent. less than in the period 1873-78.

The renewal of all tracks in 1884 was 27.4 per cent. less than in 1878, while the aggregate ton mileage of the four years next preceding 1884 was 44½ per cent. greater than that of the four years next preceding 1878.

THE RENEWALS.

	Ties renewed.	Miles.	Per cent. of entire track.
1873	403,643	154.48	
1874	669,092	242.77	13.22
1875	522,753	185.43	10.01
1876	523,451	190.20	10.02
1877	574,056	214.70	11.46
1878	535,102	199.96	10.6
1880	533,470	190.52	10.00
1881	727,001	259.73	13.34
1882	661,905	237.11	11.07
1883	773,157	276.13	12.8
1884	667,804	238.50	11.07

The average annual renewal, 1873-78 (6 years), was 197.92+ miles, = 10.69+ per cent. of average total mileage of track in that period; life = 9.35 years. The average annual renewal, 1880-1884 (5 years), was 240.4 miles, = 11.68+ per cent. of average total mileage of track in that period; life = 8.56 years. The average annual renewal for the 11 years named was 217.23 miles = 11.22+ per cent.; life = 8.912 years.

The aggregate cost of ties for the 5 years, 1880-1884, was 20.06 per cent. of the aggregate cost of maintenance of track and roadbed, exclusive of bridges, etc.; the cost of ties was 46+ c. each.

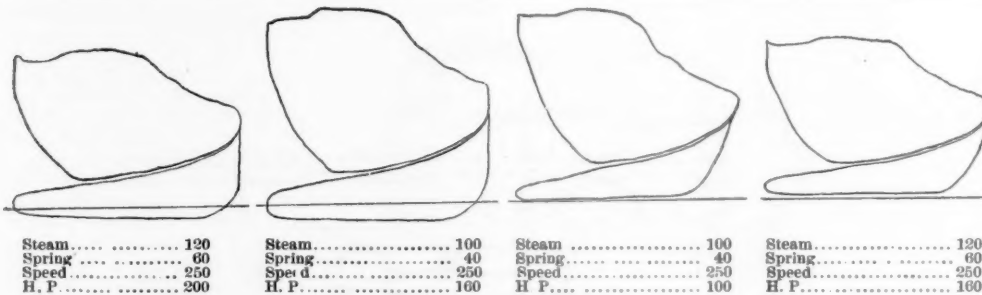
In the later period, 1885-86, the aggregate cost of ties was 24.16 per cent. of the aggregate expenditure for maintenance of track and roadbed, exclusive of bridges, etc.; ties cost about 50c.

The data which we have used herein are far from being sufficient to the establishment of a first standard by which the value of a steel-rail track, as compared with an iron-rail track, might be fixed; indeed I do not know that complete data to that end are, anywhere, at this time, to be had; but my deductions from those used are, I believe, legitimate; and these showings of the actual working of the steel rail in extended practice will, I trust, be of some value, even if they do no more than suggest further similar research.

The Westinghouse Compound Engine.

We recently published some experiments showing the economical performance of non-condensing engines when working on the compound and single cylinder principle; and called attention to the desirability of further experiments with this type of engine. We now lay before our readers the results of tests with a compound engine, condensing and non-condensing, the same engine being used for both sets of experiments, and all the conditions, with the exception of the back-pressure, being maintained constant. The experiments were made with the well-known Westinghouse engine compounded. Two sectional elevations of this engine are shown; and it will be seen that there are two cylinders, side by side, each containing a single acting piston, the two cranks being set at an angle of 180 deg. A single valve, of the balanced-piston type, controls the steam distribution. Live steam is admitted into the high-pressure cylinder, cut-off at a point determined by the lap of the valve; and the exhaust from the high-pressure cylinder passes directly into the low-pressure cylinder, without the interposition of a receiver, and with a very small clearance volume. Probably nothing simpler in the form of a compound steam engine has ever been devised. The engine has the features of the single cylinder Westinghouse machine, for self-lubrication and compensation for lost motion.

These compound engines are built in 16 sizes, 5 to 500 horse-power, for an initial pressure of 100 pounds per square



Tests of Westinghouse Engine, 14" and 24" X 14" Compound.

inch. They are designed to be run at high speed, the velocity of piston in feet per minute varying from 333 for the engine with a stroke of 6 in., to 700 for a stroke of 20 in.

The engine with which the experiments were made has a stroke of 14 in., and 2 cylinders with diameters of 14 and 24 in. respectively. The following are the results of the tests as furnished by the Westinghouse Machine Co.:

TESTS OF WESTINGHOUSE COMPOUND ENGINE, FEBRUARY, 1888.

CONSUMPTION OF WATER.

Lbs. per Brake Horse-power at Varying Pressures and Loads.

Condensing.					Non-condensing.				
Brake horse power.	Boiler pressure.				Brake horse power.	Boiler pressure.			
	120	100	80	60		120	100	80	60
200	19.02	22.53	23.17	24.3	200	23.94	25.2	27.7	29.8
160	18.86	20.02	21.32	22.4	160	23.5	25.2	27.7	29.8
130	18.38	19.56	21.32	22.4	130	23.32	25.2	27.7	29.8
100	19.14	19.44	20.34	21.1	100	25.57	27.75	29.8	31.7
70	19.8	20.05	21.43	22.57	70	26.51	28.3	29.8	31.7
40	22.9	23.12	24.75	25.25	40	29.4	30.77	32.48	36.0
						40.05	39.3	42.75	45.82

No details of the experiments, such as form of brake, manner of measuring the water, ratio of expansion and indicated horse-power, accompany the foregoing data. Some copies of indicator diagrams were sent, and an approximate calculation made from the ratio of absolute pressure at cut-off to terminal pressure, gives ratios of expansion ranging from 4.5 to 9. A few of these diagrams are printed, and show unusually good action at the high speeds under which the engine was operated. It is presumed that the results of the preceding table are averaged from a large series of experiments; because it would be extraordinary, if not impossible, to make such a number of tests with a friction-brake, without introducing some fractions into the figures representing horse-power.

The steam consumption per brake horse-power, as shown by these experiments, if not unprecedented, has rarely been equaled by engines with unjacketed cylinders and using saturated steam. We hope that the Westinghouse Machine Company will continue these experiments, under such conditions that there can be no chance to question the conclusions, and publish the results of thorough tests, in which all the elements shall be carefully measured or weighed.

Sewall Coupler with Gold Trap and Hose Nozzle.

The accompanying illustration represents a Sewall coupler for continuous steam heating, with the addition of a Gold trap for letting out the condensed water, and a Gold nozzle for securing the hose. Both the nozzle and the trap have been previously illustrated and described in the *Railroad Gazette*, but the arrangement here shown is novel, and combines the best features of two different systems of heating. The Gold Heating Co. will now supply either their own or the Sewall coupler, or the old form of the Gold coupler, as may be desired, while the Sewall Car Heating Co. will supply their coupler with or without the Gold trap. If purchasers do not require a trap, a plain plug can be screwed into the hole made for the trap, and the trap can at any time be added if found requisite. It will be noticed that the trap acts by pressure, and that it is kept off the face by a light spiral spring. As long as there is any pressure in the pipe the pressure keeps the valve seated and prevents any escape of steam. When the pressure falls the spring overcomes the pressure of steam and lifts the valve off its seat, allowing condensed water to escape. It is obvious that little condensation can take place until the pressure of the steam in the pipes has fallen materially, and, therefore, this trap is likely to prove effective in getting rid of condensed water, while it is claimed that it is free from the objections found with traps that are actuated by expansion of fluids or metals by heat.

The Geography of the Eastern End of the Union Pacific.

BY D. H. AINSWORTH.

The writer having occasion to refer to the law authorizing the construction of the Union Pacific Railroad, examined all the law libraries of the town in search of a copy without success, and even applied to a member of Congress then in Washington with like result.

It then seemed that there was good reason that the public had not been well advised as to the privileges granted to, or the obligations incurred by the companies receiving such privileges.

The Act of 1862 and the amendment of 1864, authorized the Union Pacific Railroad Co. to construct a trunk line

from a point on the 100th meridian, between the south margin of the valley of the Republican River and the north margin of the valley of the Platte, a range of about 65 miles, to the west line of the Territory of Nevada, or east line of California; and the Central Pacific Railroad Co. of California to construct a railroad and telegraph line from the Pacific coast at or near San Francisco, or from the navigable waters of the Sacramento River, to a junction with the Union Pacific at the east line of California. The Union Pacific Railroad Co. was also authorized to build from the Missouri River, at or near Omaha, to the 100th meridian; the Leavenworth, Pawnee & Western Railroad Co. of Kansas, afterward known as the Union Pacific Eastern Division, was authorized to build from a connection with the Pacific Railroad of Missouri, at the mouth of the Kansas or Kaw River, to the initial point of the trunk line on the 100th meridian; the Hannibal & St. Joseph Railroad Co. could build, via Atchison, either to the Eastern Division or to the branch from near Omaha. The Union Pacific Railroad Co., whose branch leaves the Missouri River at or near Omaha, could itself build, or authorize another company reaching Sioux City through the states of Iowa and Minnesota, to build a branch from Sioux City, upon the most direct and practicable route, to a point on, and to connect with, the "Iowa Branch of the Union Pacific Railroad from Omaha," or with the Union Pacific Railroad.

It was provided that either the Omaha Branch or the Union Pacific Eastern Division, the one first reaching and establishing the initial point on the 100th meridian, should build the main line westward to the east line of California, or to the point where the Central Pacific from the west should meet it. The Burlington & Missouri River Railroad, of Iowa, was authorized to build from the Missouri south of the Platte, through the territory of Nebraska to the main line at the 100th meridian, or to the Omaha branch.

Section 15 of the amendment of 1864 says the "several companies aforesaid are hereby required to operate and use said road and telegraph for all purposes of communication travel and transportation, so far as the public and government are concerned, as one continuous line, and on such operation and use to afford and secure to each equal advantages as to rates, time and transportation without any discrimination of any kind in favor of the road or business of any or either of said companies." "Railroad" in every case implies also telegraph line.

Evidently, the intention of Congress was to provide for a main trunk from the 100th meridian to the Pacific, to be readily accessible to the various railroads approaching the Missouri River from the east, through the states of Minnesota, Iowa, and Missouri; the various branches to be located from the points named on the Missouri River, by somewhat direct routes toward the initial point on the 100th meridian, probably contemplating the development also of Eastern Nebraska and Kansas; no one suspecting at that time that agricultural lands would be found in those states, beyond a line 100 or 150 miles west of the Missouri River. But even with the assumption that only this

narrow belt was worth development, would any one fairly assume that a line making 20 miles east of south in a distance of 75 miles from Sioux City, was "the most direct and practicable route" to a point on the Iowa branch of the Union Pacific Railroad between Omaha and the 100th meridian? By this line, after going east of south 76 miles a point is reached no nearer Columbus, or a point 100 miles west of Omaha, than is the starting point at Sioux City. Is it not a marvel that a President of the United States, and a Secretary of the Interior, should approve of such a line as "Sioux City branch of the Union Pacific Railroad?"

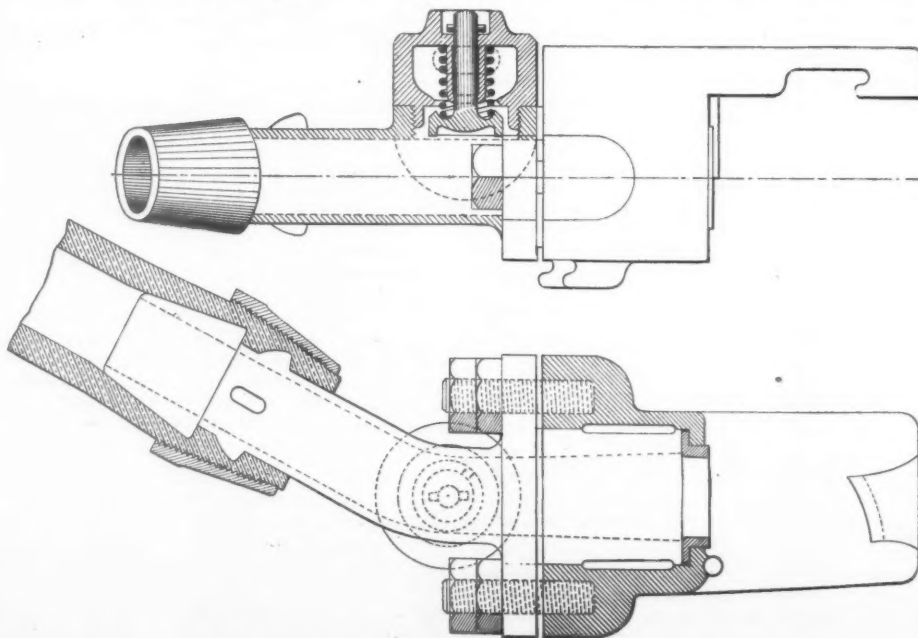
Confining our attention now to the Iowa Branch of the Union Pacific Railroad, with which the writer is the more familiar, it may not be amiss to glance at the earlier history of the railroad most directly connecting with it from the east. In 1853 Messrs. Henry Farnam and Joseph E. Sheffield had about completed the Chicago & Rock Island Railroad to Rock Island, and by August of that year the three prominent engineers, Peter A. Dey, the late B. B. Brayton, and Samuel B. Reed, as well as John E. Henry, C. E., General Manager for Farnam & Durant, who had succeeded Farnam & Sheffield, had been transferred to Iowa. Mr. Dey, with G. M. Dodge as principal assistant, had at that time located the line of the Mississippi & Missouri Railroad from Davenport, 55 miles, to Iowa City, then the state capital. The plan then was to occupy two tiers of counties, at least for the eastern half of the state; the tier including Davenport, Iowa City and Des Moines, and the one south of it with Muscatine the point on the Mississippi River. Construction was not as rapid and uninterrupted in Iowa as it had been in Illinois. By Jan. 1, 1856, the track was laid to Iowa City from Davenport, and from Wilton, about midway, south 12 miles to Muscatine. Iowa City was the terminus of the more northerly line till 1859, and track was laid to Washington on the more southerly, Sept. 1, 1858. From Iowa City, west, the line was located across the state to Council Bluffs early in 1857.

May 15, 1856, an Act of Congress was approved granting lands to Iowa for internal improvements, and July 14, following, the Legislature accepted the grant and disposed of it by giving it to four railroads across the state, from Burlington, Davenport, Lyons and Dubuque making western terminus of line from Davenport at Council Bluffs. This line was prosecuted by slow and easy stages, Marengo, Brooklyn and Grinnell becoming and remaining terminal points for irregular periods, till finally Kellogg, in Jasper County, was reached and continued the end till 1866. Then the Rock Island Company became possessors of the old Mississippi & Missouri franchise by foreclosure of mortgage, and hastened construction to Missouri River.

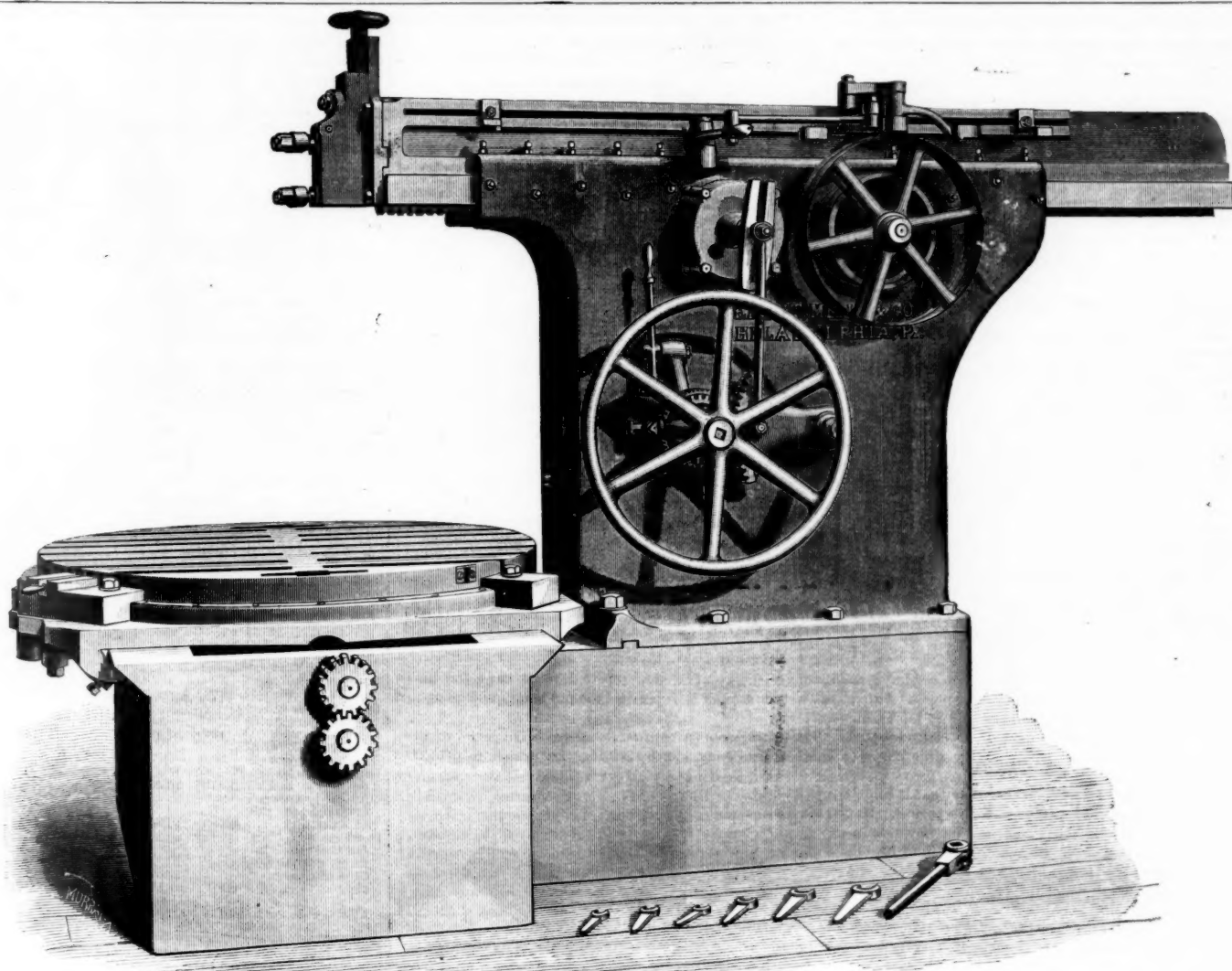
Gen. Dodge having early located on the "Western Slope," interests were doubtless created and established that had much to do with the naming by the Iowa Legislature of Council Bluffs as the terminus of the Mississippi & Missouri Railroad, and with the recommendation to the President of the United States, of the establishment in the neighborhood of Omaha of the initial point of the Iowa Branch of the Union Pacific Railroad.

In 1859 or 1860 Baldwin & Dodge established a business house in Denver, freighting their goods by ox or mule trains across the plains from the Missouri River. Probably about that time Dodge made examinations of mountain passes with reference to future construction of a railroad. In 1862 Mr. Peter A. Dey, now, and since its organization, a member of the Railroad Commission of Iowa, made for Henry Farnam a reconnaissance of the country from the Missouri River to Salt Lake, and reported favorably of the line about as built. His report was transferred by Mr. Farnam to Mr. Durant, and was doubtless included in those passed by him to the Union Pacific Railroad Company after its organization, with reports of Gen. Dodge and B. B. Brayton, as well as that of Mr. Dey in 1863.

After the organization of the Union Pacific Railroad Company, Mr. Dey was its Chief Engineer until his resignation



The Sewall Coupler, with Gold's Trap and Hose Nozzle.



LOCOMOTIVE CYLINDER SHAPING MACHINE.

Made by BEMENT, MILES & Co., Philadelphia, Pa.

early in 1865. Of the many surveys made from the Missouri River under his direction, he reported "most unequivocally" in favor of the line from Bellevue, 10 miles below Omaha. Another distinguished civil engineer in his report on bridging the Missouri River, made in 1868, says: "I cannot doubt that all the engineers who have reported upon bridging the Missouri in order to connect the Iowa roads with the Union Pacific, had they felt that they were at liberty to look so far from Omaha, would have selected the point near the Bellevue trading post as the best point for crossing the river."

Bellevue had been laid out and plotted by a mission society, as was supposed, on a liberal scale, and for beauty of location was unsurpassed by any Missouri River town in Nebraska, becoming the seat of the first territorial government. The governor of the territory dying, the "acting governor" is said to have asked an interest in the town site in consideration of its continuing to be the territorial capital. This was rejected, the purchase of government officials not being deemed consistent with the position of the owners. Omaha, however, was not entirely controlled by any religious body at that time. The capital of Nebraska was moved from Bellevue to Omaha in 1855, and some of the buildings followed the seat of government.

Had those controlling the interests of the only railroad that was then considered a factor in the choice of an Eastern terminus of what is now the Omaha branch of the Union Pacific, but kept in view only engineering questions, and those relating to the success of railroads as commercial enterprises, it is doubtful whether Council Bluffs would have been named by the Legislature of Iowa as the Western terminus of the Mississippi & Missouri Railroad in 1856, or whether Omaha would have been fixed upon as the Eastern terminus of the Iowa branch of the Union Pacific in November, 1863. In neither of these places previous to these dates had any one acquired "vested rights in geographical position."

Even had Council Bluffs kept its pre-eminence as a Western terminus named by the Legislature of Iowa, it would only have been necessary to push its 25 square miles bodily a mile further South. Had Omaha not been named by President Lincoln as an Eastern terminus, but Bellevue in its stead, there would only have been retributive justice in causing conditions that would have occasioned the return of buildings from Omaha to their old sites in Bellevue.

Had the Mississippi & Missouri Railroad—now the Chicago, Rock Island & Pacific—not turned sharply to the right at Council Bluffs, but maintained its general direction in Mosquito Creek Valley till it struck the Missouri River, it would have reached a point on the present line of the Union Pacific, via Bellevue, with four miles less distance than via Omaha. The chief city of Nebraska would then have been accessible from any direction by the valleys of the Missouri, the Platte,

the Papillion and all its tributaries, not excluding Mud Creek, now occupied by the present line via Omaha. It could have spread itself to what is now South Omaha on the north to the Platte on the south. The Burlington & Missouri River, even if it had constructed its original line as now built via Plattsmouth, could have reached this chief city with much less mileage, and much less proportional expense. The Chicago & Northwestern would have kept its present direct line to Fremont, and considering the wants on the Iowa side of the Missouri River, would not have been much the loser by additional cheap mileage there. The Sioux City & Pacific would have been as now, unless a better sense of the fitness of things had caused it to be located directly to Columbus.

The writer would hardly like to be accused of the folly of antagonizing Omaha, as she is now with the proof of her ability to more than take care of herself. Her courage and enterprise are admirable. No jealousy can shun her without exciting contempt. To approach means to be absorbed by her. He remembers, however, when a single individual, with interests outside, could keep the whole town in a ferment until after the location of the bridge across the river at Omaha was fixed and its construction well under way, and believes that the identical energy that made Omaha what she is would have been readily transferred to another city site had different counsels prevailed among railroad schemers in 1864 and 1865. Politics and real estate interests, particularly the latter, had more to do with the location of the eastern terminus of a "great continental road" than did engineering questions or the financial prosperity of a great commercial enterprise.

Cylinder-Shaping Machine.

The machine which we illustrate is designed expressly for planing the valve and steam chest seats of locomotive cylinders. It is an instance of the numerous special machine tools rendered necessary, and at the same time possible, by the great demand for locomotive engines. A considerable number of these machines are in use in the principal building and repair works, producing superior work with great economy of space, power and labor.

The cutter bar has been designed to obtain large bearing surfaces and great stiffness without unnecessary weight. Its stroke is adjustable to any position and length within 42 in., with a very rapid return.

The circular table is 54 in. in diameter, is amply provided with bolt slots for securing the cylinder fixtures, and is so arranged that it can be easily rotated and accurately and rigidly locked in three positions 90 degrees apart. The cylinder being so held by suitable fixtures that its axis shall be parallel to the planed grooves of the table, can thus be at

once placed with exactness in any of the positions required for planing.

The table is mounted upon a very heavy saddle, having a transverse sliding movement of 34 in. by a variable automatic feed which is operated directly from the driving works and is self-releasing when not moving. A quick traverse in either direction, by hand or power, is also provided. All the movements are controlled from one convenient position.

It is claimed that the four surfaces of the steam chest seat are easily made to match perfectly, and, as the belts are very accurately shifted, the ports can be planed for nearly their entire length, leaving only a small amount to be chipped at each end.

The builders are Bement, Miles & Co., Philadelphia, Pa.

Experiments with Heat Insulators.

Nearly all manufacturers of boilers and engines and steam-users agree that it is desirable to cover the exposed surfaces of boilers, pipes, cylinders, etc., in which steam is generated, transmitted or used, with some good non-conductor of heat. Time was when a simple wood lagging was considered all sufficient, but at present the lagging, when it is used at all, is generally added for the purpose of giving a finish to the work. So many kinds of heat insulators have been put upon the market, each highly recommended by the vender, that it is difficult for the steam user to make an intelligent choice in many cases. But nearly all the prominent varieties have been subjected to comparative tests, by means of which some leading principles have been established. It is generally agreed, for instance, that a jacket of dry air forms one of the most efficient heat insulators which can be devised, if only the air can be maintained in a state of perfect calm. This being practically impossible, it is found that the next best insulator is some substance which is very porous, so that it contains a large amount of air, if, in addition to its porosity, it is non-combustible as well. In the numerous experiments on heat insulators which have been published, hair felt almost invariably stands at the head, and although it is liable to be charred or burned by the heat from steam pipes, the destructive action can be prevented to some extent by first covering the heated surface with asbestos paper.

Protected in this manner, hair felt is one of the most popular insulators in the market, in all respects save that of price, and it is with the idea of furnishing a cheaper insulating material which shall have all the advantages of hair felt, with the additional characteristic of being non-combustible, that so many inventors have entered the field. As is well known by persons who have investigated the subject, there are several varieties of heat insulators which are non-combustible and differ little from hair felt in non-conducting qualities. The Magnesia Sectional Covering Company have sent us some data relating to their insulator, together with

TESTS OF NON-CONDUCTING PIPE-COVERINGS, BY EBERHARD LUTTGEN, PH. B., F. C. S.

Number for reference.	Description of covering.	Thick- ness of covering.	Weight of cover- ing per running foot of pipe.	Steam Condensed.					
				Per square foot of external surface of pipe.					
				Total.		Total.		For each difference of 1° Fahrenheit, between internal and external temperatures.	
				Lb.	British thermal units.	Lb.	British thermal units.	Lb.	British thermal units.
1	Hair-felt, wrapped with twine, covered with burlap.	1 1/8	0.781	0.459	428.9	0.133	115.0	0.000528	0.494
2	Sectional Asbestos paper jacket	1 1/8	1.266	0.500	468.1	0.134	125.5	0.000576	0.539
3	magnesium carbonate. Canvas jacket.	1 1/8	1.266	0.508	470.2	0.135	126.0	0.000578	0.541
4	Plastic magnesium carbonate.	1 1/8	0.699	653.7	0.187	175.2	0.000804	0.752	
5	Plastic magnesium carbonate.	1 1/8	0.571	584.1	0.153	143.2	0.000657	0.615	
6	Plastic magnesium carbonate.	1 1/8	0.560	523.8	0.150	140.4	0.000644	0.603	
7	Sectional mineral wool, asbestos paper, mineral wool, muslin.	1 1/8	1.797	0.509	476.4	0.137	127.5	0.000586	0.548
8	Chalmers-Spence Co.'s covering, layers of asbestos paper, asbestos fibre, hair-felt, sheathing-paper.	1 1/8	1.766	0.551	515.6	0.148	138.5	0.000634	0.593
9	Bradley's insulated air covering, layers of asbestos and sheathing paper.	1 1/8	1.703	0.561	525.9	0.151	141.0	0.000647	0.605
10	Reed's covering, asbestos paper, felt-paper.	1 1/8	1.672	0.595	556.8	0.160	149.6	0.000685	0.641
11	Fossil meal, mixed with water, and applied with a trowel.	1 1/8	1.5	0.761	711.5	0.204	190.7	0.000875	0.819
12	Ainsworth's plastic covering, clay, paper-pulp, hair.	1 1/8	4.125	1.279	1196.1	0.343	320.6	0.001472	1.377
13	Uncovered pipe.	0	0	2.381	2227.2	0.648	597.0	0.002740	2.563

some comparative tests made by Mr. Eberhard Luttgen. The insulator is a carbonate of magnesium, mixed with a slight quantity of asbestos fibre for the purpose of increasing its tenacity. It is usually made in sections, specially adapted to the surfaces which are to be protected, the different sections being held together by small staples or by strips of asbestos paper or cloth. It is also prepared so that it can be mixed with water and applied as plaster with a trowel. Mr. Luttgen found that the average weight of the magnesium carbonate in bricks was 9 1/4 lbs. per cubic foot, and by observing the amount of moisture which was absorbed by the material when immersed in water for 24 hours, he concluded that it contained something over 90 per cent. of air cells.

The comparative experiments on the non-conducting qualities of the magnesium carbonate were made in a very thorough manner, reproducing as nearly as possible the conditions of actual practice. A sufficient number of 2-in. iron pipes for the different insulators, each 6 ft. in length (external surface 0.6218 x 6 = 3.7308 sq. ft.) and slightly inclined, were supplied with steam by a well-protected pipe, and any moisture in the steam was drained out by a trap situated close to the pipes under test. An extra pipe was added on each end of the row, so as to place the first and last pipes of the series tested under the same conditions as the others in the series. The space between the coverings of adjacent pipes was about 3 in., and the pipes were located in a small room, which was tightly closed. Every hour the steam condensed in each test pipe was drawn off and measured, but the measurements were not recorded until the apparatus became thoroughly heated, so that the hourly condensation, which up to this time continually decreased, became uniform. The average temperature of the room was 70 degrees Fahrenheit, and the steam in the pipes had an average temperature of 302.9°, giving a difference of 302.9° - 70° = 232.9°. In the following table the data obtained by Mr. Luttgen are used as the basis of calculation, but some additional lines have been added to the original table for the purpose of making it more generally useful.

It is proper to remark that a Board of United States Naval Engineers state, as a result of some comparative experiments with the magnesia sectional covering, that its value as a non-conductor is 3.07 per cent. more than that of hair felt, but they do not give the details of the tests by which this result was obtained.

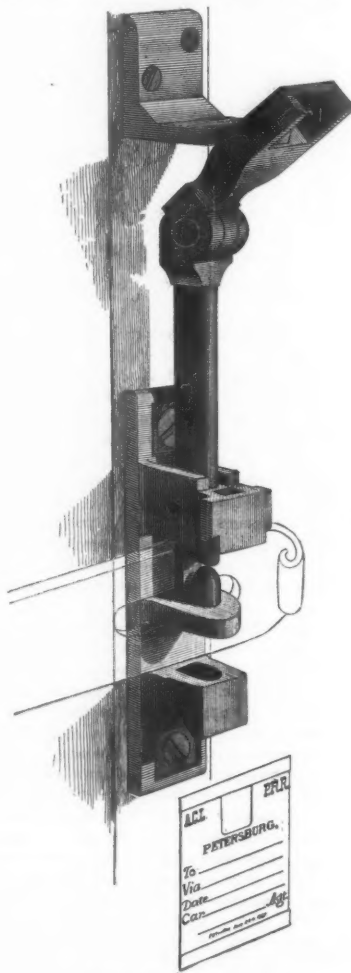
Sully's Freight Car Seal.

The illustration given herewith shows a novel freight car seal, devised by Mr. R. M. Sully, Superintendent of the Richmond & Petersburg road, Petersburg, Va.

The principle of the device consists in locking the vertical pin in position by a spring catch which is inaccessible when the seal is in position but which is readily pulled out on the destruction of the latter. A corner of the spring catch may be seen on the under side of the upturned locking-cap, and the recess which engages it is shown on the upper side of the upper lug. The lock can be moved only when the vertical pin is free at its lower end, and the presence of the tin seal in the latter prevents pulling it up, and so locks the car. The lock operates as follows: The locking cap being turned out, as shown in the cut, may be pushed down so that its lower end, which forms a hook, projects below the lower lug. The tin seal with its card-board face (2 x 2 1/2 in.) is then placed on the hook and the locking cap pressed down against the lug immediately above the hasp. Projections on the sides of the lug then engage in slots on the inner sides of the cap and guide it while it is pushed upward. The upward movement draws the tin into the recess on the bottom of the lower lug. When this movement is completed the cap is locked in place by the joint action of the spring catch and the tin, the latter preventing upward movement and the spring preventing downward. The spring being inaccessible the only way of unlocking the car is by breaking the tin along the perforated line, about 1/4 in. from

its upper edge. The stop screwed to the car a few inches above the fastener is to prevent the pin being pulled out and lost.

The distinguishing feature of this seal is the perforated tin, which is readily broken by bending, but which is protected



Sully's Freight Car Seal.

from injury in transit by the iron parts around it; and the combination with this of the card manifest, the two thus being put upon the car at one operation. The seal is said to be cheaper than the better quality of lead and wire seals, and it has the obvious advantage of being applied without the aid of any press, lever or other instrument. This advantage has heretofore generally been attained only by the use of glass or cast iron, either of which is more bulky and inconvenient than tin. The apparatus has a perforation through the pin and upper lug so as to admit of the use of wire seals when the car is on a foreign road. This seal has been used on the roads of the Atlantic Coast Line, the Seaboard & Roanoke and other lines for the past year, and is warmly praised by the men who handle it.

Baltimore & Ohio Employees' Relief Association.

ANNUAL REPORT.

Below are the essential portions of the seventh annual report of this association. The figures are given substantially

in full, and are followed by such portions of the Secretary's observations as are of general interest.

Receipts for the year ended Sept. 30, 1887:

Balance on hand Sept. 30, 1886.	\$184,157
Premiums from members.	\$358,534
Dividends on temporarily invested surplus.	8,086
Interest on monthly balances.	427
All other sources.	304
Total.	\$551,508

The disbursements for the year have been:

Benefits to members.	\$288,607
Payments to physicians, hospitals, medicines, printing monthly and annual reports, etc.	58,160
Total disbursements.	346,773

Balance Sept. 30, 1887.	\$204,732
Add uncollected assets, consisting of interest on deposits and premium due from savings fund and building feature on account of additional natural death insurance taken to secure loans.	1,170
Gross available surplus Sept. 30, 1887.	\$205,906

Deduct outstanding liabilities, consisting of moneys due members, physicians and hospitals, on cases originating prior to Sept. 30, 1887, and yet unpaid.

Reserve to provide for increasing ages of members and for annuities.	36,437
Net balance Sept. 30, 1887.	\$71,144

BENEFITS PAID.

	Oct. 1, 1886, to Sept. 30, 1887.		Total since starting association.		Average per payment.
	No. of pay- ments.	Costing.	No. of pay- ments.	Costing.	
Deaths from acci- dents.	73	\$80,000	380	\$398,025	\$1,047.43
Deaths from other causes than acci- dents.	130	57,496	751	263,107	246.34
Disbursements from injuries received in discharge of duty.	3,074	53,521	18,814	247,041	13.13
Surgical expenses involved in the above.	2,259	13,835	11,756	77,824	6.62
Disbursements from sickness and in- juries not received in discharge of duty.	6,517	97,590	35,850	527,669	14.70
Aggregate.	12,953	\$302,442	67,501	\$1,510,666	\$22.35

"The business of the association has largely increased during the past year, as shown by the fact that the present active membership is 22,155, an increase over last year of 1,858. Since the inauguration of the association (May 1, 1880) 70,029 persons have been admitted to membership, of which number 10,922 made application during the past fiscal year. The examination to determine the physical condition of persons applying for membership has resulted in the rejection of 1,460 out of a total of 18,353, and of 149 of those who were examined for sight, hearing and color sense.

"The Committee of Management has increased the natural death benefit 200 per cent. above the amount guaranteed by the constitution, thereby making each rate (or benefit) of natural death worth \$300, instead of \$100, as originally agreed."

"Persons leaving the service, are permitted to retain their interest in the natural death feature by the payment of 25 cents monthly for each rate for which they may be insured. Under the present value of the natural death benefit (\$300 for a single rate), the premium is less than in any insurance company in the country, being only \$10 per annum for an insurance of \$1,000. The Pension Feature has been doing good work during the past year, having added 37 names to its rolls, making a total since Oct. 1, 1884, of 195 who have received the benefit of this admirable conception as a reward for faithful service. There are at present 165 names on this 'roll of honor,' 30 of the total number having passed away. The funds applicable to this are so limited that it is not wise, at this time, to increase the number now receiving benefits therefrom. This feature is wholly sustained by the Baltimore & Ohio Railroad, no portion of the contributions of members of the Relief Association being used for this support.

SAVINGS AND BUILDING FUND.

This fund, which has closed its fifth year, has 730 borrowers, and has opened 381 new deposit accounts during the year.

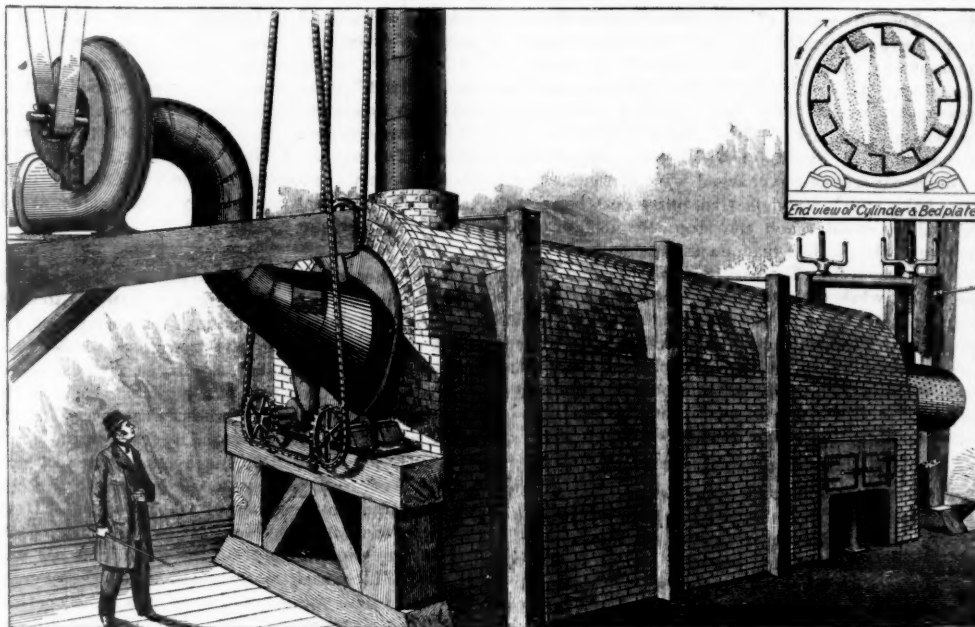
"The total amount received from depositors during the year was \$221,893, an increase over the previous year of \$12,103, making the aggregate of deposits since Aug. 1, 1882, when the Savings Fund was inaugurated, \$730,560; of which \$288,756 have been withdrawn: the sum of \$453,787 has been loaned, at the rate of 6 per cent. interest, to employees desirous of obtaining homes upon the lines of the road, of which \$122,109 have been repaid.

"This amount was expended in building 259 new houses, buying 257 houses, improving 69 houses already owned, and releasing liens in 153 cases. The loan feature has become exceedingly popular, the applications to utilize this feature largely exceeding, during almost the entire year, the funds available for this purpose.

"An erroneous impression prevails among employees, to some extent, that the surplus funds of the Relief Feature are available for this purpose, or that the Savings Fund can command funds from the B. & O. Co. or other sources for the purpose of carrying on the operations of the Building Feature. The Relief Feature and the Savings Fund are as distinct as it is possible for any two institutions to be; they are distinct and separate. The Savings Fund is entirely dependent, so far as its funds to meet applications for loans are concerned, upon the amounts received from depositors and the amounts repaid monthly by borrowers, and the interest received from its investments, and a cash reserve is retained on hand so that the management may be able to meet all possible demands of depositors. The investments made by the Board of Trustees are in first mortgages on real estate, and much care is exercised in securing good titles."

Results of the Per Diem System.

The figures given below show the performance of cars of the West Shore Railroad on roads operating the per diem car service system, and of the cars of such roads on the West Shore during the months of January and February



THE WORRELL SAND DRIER.

1888, as compared with the same period in 1887, under the old straight mileage system:

JANUARY.

West Shore cars on per diem roads.				Cars of per diem roads on West Shore.			
Year.	Total number of cars handled...	Average number of days detained.	Average mileage per car per day.	Year.	Total number of cars handled...	Average number of days detained.	Average mileage per car per day.
1887...	4,361	5.5	23.1	1887...	4,682	5.3	23.8
1888...	3,000	6.6	24.2	1888...	3,748	4.6	25.7

FEBRUARY.

West Shore cars on per diem roads.				Cars of per diem roads on West Shore.			
Year.	Total number of cars handled...	Average number of days detained.	Average mileage per car per day.	Year.	Total number of cars handled...	Average number of days detained.	Average mileage per car per day.
1887...	3,143	6.6	20.6	1887...	5,008	5.5	24.7
1888...	3,525	5.6	24.5	1888...	5,152	3.7	32.0

The above figures represent the performance of cars interchanged between the West Shore and the 28 roads co-operating under the per diem system. Taking as a basis the figures for February, which represent the performance after the per diem system had been in operation one month, there is shown a decrease in detention of one day per car and an increase in mileage of 3.9 miles per car per day. The roads represented own or control 309,123 cars. It is fair to assume that the force producing the increased movement and decreased detention of West Shore cars on the respective roads affected in like manner that proportion of the cars owned, which were located during the month on the roads in the per diem system. The officers in charge agree in estimating that about one-third of their cars were on foreign roads using the old system. On this basis 206,082 cars were detained (on per diem roads) one day less in February this year than in February, 1887, equal to 206,082 days or 7,106 cars per day, representing, at \$500 per car, a saving of \$3,553,000 on investment in equipment. The increase in mileage of 3.9 miles per car per day applied to the 206,082 cars in question at $\frac{1}{2}$ cents per mile amounts to \$6,028 per day, or \$180,837 per month.

The Worrell Sand Drier.

This apparatus consists of a cylinder of steel plate, inclosed in a brick furnace. On each end of the cylinder is a cast iron flange with a half-round rim, and motion is given to the cylinder by chilled friction wheels acting against these flanges. The friction wheels, as will be seen, are operated by link belts from a single countershaft overhead. The wheels at the far end of the cylinder are swung between upright posts, by two lifting screws, in order to vary the inclination of the cylinder, by which the flow of the sand through it is regulated. These friction wheels are carried on Babbitt bearings. A balanced sliding gate closes the elliptical opening in the end of the furnace in which the cylinder moves up and down. The sectional view shows steel angle troughs riveted to the interior of the cylinder. These extend the whole length, and not only aid to distribute the sand but also add to the stiffness and heating surface of the cylinder. A large exhaust fan draws air through the cylinder from the far end and discharges outdoors. A spiral iron conveyor

leading from the draining bins brings the sand to the cylinder, into which it is fed through the conical spout shown in the engraving. It will be seen that the far end of the cylinder is perforated to screen the sand after it is dried, thus combining the two operations of drying and screening.

In operation the wet sand is fed through the spout shown into the cylinder, and is repeatedly taken up by the troughs and poured out again in a number of thin streams, while the air not only passes between the streams, but, owing to the rotation of the cylinder, the current passes through the streams of sand spirally, so that the sand is very thoroughly exposed to the heated air in its passage. It is claimed further that by this arrangement the temperature of the material drying is kept so low as to permit of the use of this apparatus for drying grain without scorching it. This machine embodies in a very simple manner the three absolute requirements of economical drying, namely, plenty of air, a great amount of heating surface and a direct application of the heat. It has been in use in different parts of the country for six years and is highly spoken of. Several sizes are made, and some modifications are used for drying very wet products and fibrous materials.

A machine has been recently set up for the Millington White Sand Co., of Chicago. This sand is mostly used for making glass and is first thoroughly washed and after draining 24 hours it retains nearly 10 per cent. by weight of moisture. Locomotive sand would ordinarily not carry more than one-third as much moisture. This machine was guaranteed to handle not less than 4 tons per hour, and has lately been drying twice that amount, even while the sand was frozen. The following table compares the performance of one of these driers with an ordinary railroad stove drier, and is the result of actual experiment:

	Railroad stove drier.	Worrell's No. 3 drying machine.
Pounds wet sand dried and screened per hour	675	16,000
Pounds common soft coal consumed per hour	24	180
Pounds water dried out per pound coal burned	1	8 $\frac{1}{2}$
Average percentage of water in the two offers at sands	.035	.093
Men's labor required	1	3
Expense of drying one ton of sand.		
Cost of labor at 15 cents per hour	\$.44	\$.05 $\frac{1}{2}$
Cost of coal at 12 $\frac{1}{2}$ cents per bushel	.11 $\frac{1}{2}$	.03 $\frac{1}{2}$
Cost of steam motive power	.03	.03
Cost of interest, repairs and depreciation	.02	.02
Total	.57 $\frac{1}{2}$ cts.	.14 c's.

Further particulars with regard to this machine can be obtained from the maker and patentee, F. E. Worrell, Hannibal, Mo.

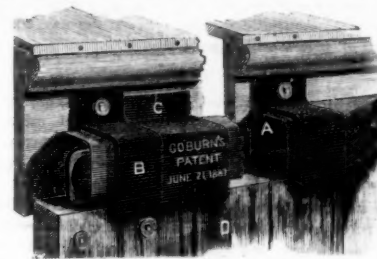
The Baltimore Car Wheel Co.'s Steel Tired Wheel.

The wheel shown in the accompanying engraving is offered by the makers as having some special merits besides its simplicity. The tire is shrunk on, and it is so set that it is supported by the body or centre upon its outer edges and not upon its inner surface directly opposite where the load is applied. It is claimed that by this arrangement whatever

yielding or resilient qualities there may be in the tire act to diminish jars and shocks. The centre is of charcoal iron, annealed, with internal ribs, and the centres and tires are interchangeable. One point in which the makers claim an advantage over some other forms of tired wheels is that this wheel can be re-tired in an ordinary machine shop, saving the delay and expense of returning wheels to the makers.

The Coburn Door Hanger.

The cut herewith shows a new device for hanging freight car as well as other sliding doors. It is known as the Coburn door hanger and is manufactured by the Coburn Trolley Track Manufacturing Co., of Holyoke, Mass. The track A possesses entirely new and distinctive features, and is made in a drop press from a single piece of sheet steel. When taken from the press it is absolutely true and straight, and from its peculiar form possesses great strength and stiffness. The wheels or rollers are made of cast iron in pairs with a hardened steel pin. These wheels roll on their periphery in the grooves of the track, while the centre pin rolls on the wrought-iron hanger which is attached to the door. The track is held in position by brackets B, and the brackets are secured by lag screws or bolts. A steel shield held in position by these same lag screws or bolts covers the entire track



and laps over top of door, thereby making it absolutely storm and dirt proof.

Page, Newell & Co., 139 Milk street, Boston, and 16 Dey street, New York, are general sales agents.

TECHNICAL.

Traction Increaser on the Erie.

Craven's traction increaser, which is a drawbar between the locomotive and tender that automatically transfers a portion of the weight of the tender to the driving wheels of the engine in proportion to the load which the engine is pulling, has lately been tried on the New York, Lake Erie & Western. It was first attached to No. 604, a consolidation engine with 950 lbs. less on the rear drivers than on the other pairs. This engine hauled 10 per cent. more than its regular load from Hornellsville to Susquehanna, making running time. Subsequently the drawbar was attached to a 38-ton engine with 4-coupled drivers 5 ft. dia. and cylinders 18 x 22. Weight on driving wheels 48,000 lbs., 2,000 lbs. dead weight which had been placed on the foot board to increase the adhesion having been removed.

This engine took 12 $\frac{1}{2}$ per cent. above the regular load, and in another case 14 per cent. additional, and made a creditable performance on the round trip between the points before named on a day when a fine mist was falling during nearly the whole trip, there not being enough rain at any time to wash the rails.

New Ferryboat.

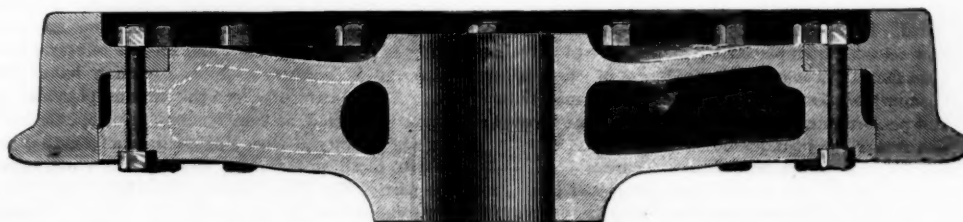
The Staten Island ferry steamer, the "Erastus Wiman," was successfully launched from the works of the Columbian Iron Works in Baltimore, April 26. She is built of steel, and is one of the largest craft of the kind ever constructed. Her length is nearly 300 ft., and accommodation is provided for 3,000 passengers. The machinery is all on the hull, and there is no walking beam to obstruct the full sweep of the saloon and hurricane deck. The speed is guaranteed to be 20 miles an hour and the cost is \$185,000.

Another Electric Motor for the Elevated.

The Gilbert Car Mfg. Co., of Troy, has recently completed from the designs of the Sprague Electric Motor Co., for experimental work on the Manhattan Elevated, one of the largest and most perfect electric cars ever built. This car is 46 ft. long, has eight 42-in. drivers, and will carry 75 horse-power on each axle, or a total of 300 horse-power. The construction of the motors is well under way. When completed they will give a draw-bar strain of 15,000 lbs., double that developed by the present elevated locomotives.

A Powerful Testing Machine.

Riehl Bros. have just completed a new and improved screw power testing machine, of 100,000 lbs. capacity, for the Baltimore & Ohio. It is adapted to testing metals and other material, in tension, transverse or compression strains. There are no loose weights, and a single traveling poise, operated by a light hand-wheel, registers the strains with accuracy by means of a vernier. The power is applied and reversed by means of a reversing lever, working in conjunction with a notched quadrant, and throwing a friction cone in gear with either, or cross belts, as required. Anti-friction bearings of hardened steel balls are used to diminish the friction so objectionable in the use of screw power. The machine has also many other improvements on those previously made.



Steel-tired Wheel, Baltimore Car Wheel Co.



Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

There have been plenty of railroads abandoned before they were put into operation, but the abandonment of a line after it has been for a long time in regular operation is something quite unusual. This is what is just happening to the Pemberton & Hightstown Railroad, one of the New Jersey lines of the Pennsylvania system. It was built in 1868, was 25 miles long, and cost \$540,000. It never paid expenses, and has been a constant source of loss to the Pennsylvania, which has offered the road for sale at \$100,000 without finding a purchaser. Great dissatisfaction is felt with the proposed policy of abandoning the road, but it is hard to see how the law can prevent it. The fact that a company has made a losing investment does not, or ought not to, force it to continue to lose money for all time for some one else's benefit. Of course if the company ceases to run the road it will probably lose the right to the real estate. It was taken for railroad purposes; if the railroad does not run, the purposes cease to be fulfilled. We do not believe that the Pennsylvania will undertake to get any special act of the legislature to avoid this result; nor would such action be likely to succeed. The least the company can do is to let the land revert to its original owners, and be thankful to get off at that.

Some weeks ago, in commenting on the fact that the corrugated fire-boxes of the Strong locomotive had been taken out for changes, we said that this did not prove that the system is inapplicable to locomotives, but that the joints must be carefully made and in such a manner that they can be calked. At the same time we mentioned the long and successful use of the Fox corrugated flue in marine engineering. *The Engineer* (London) quotes these remarks and adds that "American locomotive builders break down in the matter of workmanship when they try what is to them a new thing." This proposition is so grotesque that it simply needs to be stated to be laughed out of court. It is no doubt considerably within the truth to say that half of all the railroad mileage of the world is worked by locomotives made by American builders, and with all modesty it may be claimed that their performance is fairly acceptable, and that the problems which have been met and successfully solved in their design and construction have been both numerous and novel. Had our amiable contemporary heard of some new colonial order placed in America, or had its feelings been rasped by some fresh evidence of the superior economy of American locomotives, in maintenance and performance, that it should have been provoked to a remark so injudicious?

It has often been urged that compressed gas is not a safe material to use for lighting trains, as any sudden escape of gas caused by a collision or the failure of the apparatus would be liable to ignite and set the cars on

fire. The advocates of compressed gas on the other hand have contended that the explosion would be momentary, and that while windows, etc., might be broken by the violence of the explosion, the flame produced would last too short a time to set woodwork on fire. The latter theory is confirmed by an explosion which took place recently while a car was being charged with compressed gas. The hose, which was defective, burst and before the attendant could reach the stop cock to shut off the pressure, the gas had reached an outside heater which set the gas on fire. The car, however, was but slightly scorched, while the attendant was severely, but not dangerously, burnt. As a man can be badly burnt or scalded by a temperature quite insufficient to set ordinary substances on fire, it appears that compressed gas, when carried outside a car would not be likely to set a car on fire in case of a collision, and that in most cases an explosion would be harmless.

All persons in charge of boilers are well aware that the quality of the water and the kind of fuel used have a very considerable influence on the life of the boiler, but we are all so used to the comparatively rapid deterioration of boilers that we are inclined to accept boiler repairs as inevitable. It is therefore with some surprise that we find that under certain conditions boilers run for incredible periods not only without repairs, but without inspection. On a large southern railroad some of the locomotive boilers have been running since 1857 without the dome cover joint being broken, and throughout the line the boilers were never inspected internally, unless they gave trouble. The cause of this remarkable immunity from corrosion and deterioration can only be explained by the fact that the water used is swamp water, which is very soft, and contains no ingredient making a solid incrustation. The fuel used was wood, chiefly hard pine, containing a large quantity of resin, and while a cord of this wood will evaporate about the same quantity of water as a ton of coal, the wood fuel is so peculiarly adapted to locomotive use that in nearly all the engines burning wood the original copper flues are still in use, never having been removed or pieced. Directly coal and the use of an apparently purer water from deep wells were introduced, the flues and stays began to show signs that their lifetime had certain limits.

The obvious moral is that it evidently pays to take some pains to secure a suitable water supply and good fuel for locomotives, and that under certain favorable conditions locomotive boilers, fire-boxes and flues may last almost indefinitely, notwithstanding the trying character of the service which a locomotive boiler has to perform. In the instance mentioned above, but one boiler explosion occurred in a great number of years and was apparently caused rather by defects in the original workmanship of the boiler than by any deterioration through age or corrosion. All locomotive boilers should, however, be thoroughly examined internally, and tested every few years, even where the conditions are most favorable.

The project of a tunnel to cross the East River about Thirty-fifth street, and to connect the line of the New York Central and the terminus of the Hudson tunnel, as well as other points on Manhattan Island with Long Island, has been mentioned in these columns before. Unquestionably it would be a great public benefit, and it can be opposed only by those limited property interests which it might injure temporarily, and by individuals whose schemes of personal profit might suffer from it. The probable gains or losses of those who invest their money in it are not now in question. Considered merely on public grounds, it is one of those projects for the relief of the city, and for increasing the area available for business and residence which should be encouraged by all who have in mind the welfare of the community. The company was incorporated last August, and some months ago it applied to the New York Aldermen for the necessary franchise for its openings in this city. The Railroad Committee of that body has just made a majority and a minority report. The majority report is signed by four members, three of whom are liquor dealers, and the other is a professional politician. The business of these gentlemen has given them an insight into the needs of the city, and into its relations to the surrounding country such as few men have. They have looked carefully into this tunnel plan and find that "if the scheme ever reaches fruition, the decadence of the city of New York will date from that time. It will, in all probability, destroy the commerce of the port of New York, and inflict a blow to the future progress of this city from which it will not, because it cannot, recover. Your Committee believe that they are warranted in saying that the proposed tunnel

scheme of railroad is intended almost solely as a means of diverting commerce and trade from the port of New York to the eastern end and other portions of Long Island." The minority report was signed by three men, lawyers, men of standing in the community and of honorable record. This was favorable to the franchise. The people of New York should be grateful that their city is guarded by the vigilance of those patriotic liquor dealers, and they must shudder at this narrow escape from "decadence."

On another page will be found tabulated some figures collected by Mr. J. M. Goodwin in an attempt to show something of the relation existing between the cost of track maintenance and the use of steel rails. The figures are interesting, but, as Mr. Goodwin says, are not conclusive. For the two periods compared the decrease in cost per mile of maintenance was 37.22 per cent., while the increase in total steel rail in the tracks was 38.82 per cent. But the average price of rails fell 34.25 per cent. in the same period, while the cost of other track material and of labor also fell. If we had only these figures, therefore, our conclusion could not be very encouraging; but the work done per unit of track increased materially. While the average of the total miles of track in the periods compared increased 11 per cent., the ton-mileage of traffic increased 26 per cent. This gives us a better notion of the saving from the use of steel; but, after all, it is only a rough approximation, for it does not take into account the relative condition of the track in the two periods. It is highly probable that from 1880 to 1884 much more money was spent in maintaining high perfection of line and surface than in the 1873-78 period. Without knowing pretty accurately the facts in this particular, it is not possible from figures of cost of maintenance, to justly measure the economy of the steel rail. In passing, we would hazard the conjecture that the apparent decrease in the life of ties may be accounted for on the same principle that the standard of good track has risen. Probably in later years ties have been taken out that in the earlier period would have been left to do further service. The reported figures of cost of maintenance often, if not ordinarily, show what it has been considered best to spend on this account, or to charge to this account, rather than what it has actually cost to keep the track up to a standard, and therefore can only approximately measure the true cost. In the case considered the deductions are doubtless somewhat near the truth as they are drawn from averages of considerable periods. For the reasons given it seems to us that the most significant table in Mr. Goodwin's paper is that of "Renewals of Rails." In that it will be seen that the percentage of entire track relaid fell from 20.3 in 1873 to 4.6 in 1884. Or perhaps a fairer way of putting it would be to say that the average renewal for 1873-75 was 16.85 per cent. per annum, and for 1882-84, 5.85 per cent. These figures, considered in connection with the increase of traffic, give an idea of the relative life of steel and iron rails. Mr. Goodwin has chosen to confine his study to the one question of economy in maintenance, but it is not to be assumed that he ignores that other aspect of the subject—the economy in operation which has followed the introduction of the steel rail.

The West Shore passenger trainmen now run through from Weehawken to Syracuse and from Syracuse to Buffalo. On the first named run the trips occupy eight, nine and ten hours each, making no allowance for preparation at beginning of trip, nor for delays. The distance is 278 miles and constitutes one of the longest runs we know of, though there are some a little longer. The Central of Georgia runs some of its men through between Savannah and Atlanta, 295 miles, and an engineer in Alabama recently stated in a law suit that he ran 325 miles regularly, and that sometimes he ran through from Mobile, Ala., to St. Louis, Mo., with two "lay-overs," though how long intervals were allowed was not stated.

The advantages gained by long runs are not always clearly apparent to the outside observer. That engines should make long trips is well settled, and sometimes where trains are of varying weights light and heavy engines can be adapted to trains of proper size more conveniently by running them as far as the train goes. But disarranging men's homes and boarding places without an explanation of reasons gives them a "grievance," and such action should not be taken without good and well-defined reasons. Changing runners in the middle of a trip is not by any means an impracticable thing. The New York elevated roads have no trip over 10 miles in length, and yet they work some of their engines 24 hours

daily. Many of the runners come on duty at way stations, where there is only a minute or thereabouts in which to change off. This has also been successfully done on a large scale on surface roads.

In most or all of the unusually long runs that we know of the men lie off enough days to equalize the mileage, so that they do not earn so very much more than under former systems. There is a distinct advantage in having a considerable share of the force of trainmen off duty at all times, as it affords a large reserve force in emergencies. In case of special need there would be no great harm in running men 250 miles a day for a week. But it is by no means certain that nine and ten hours on a stretch is a fair day to work engineers and firemen, or even conductors. A human being cannot work as long as a machine without fatigue, and most officers are supposed to realize it, though some seem to forget the limitations which should be observed. To work (be awake and active) 12 hours and then rest 36 is a violent departure from the old rule, supposed to be backed up by nature, that each day shall be divided into eight hours work, eight hours play and eight hours sleep.

It is to be remembered, however, that there is a great difference in the wear and worry of runs, some being ten times easier than others. Three hundred miles at 30 miles an hour with few stops, few trains to meet, a light train to haul, long tangents through "tame" country, making the lookout easy, might be perfectly tolerable for a runner, while the same distance and hours on another line might wear out a man in a comparatively short time. On the North London (England) there is a run of 16½ miles, in the course of which there are 14 junctions to be passed and 65 signals which must be obeyed by the runner. This trip, including seven stops, has to be made in 34 minutes. Eight hours on a stretch of such work as that would be exceedingly trying. The runners on the New York elevated work 8½ hours continuously, but they generally have a stop of about 15 minutes at the termini (say once an hour), and the tension on their nerves is somewhat mitigated by the moderate speed at which they run. They have probably two or three times as much time in which to see signals and act on them, in many cases, as do the runners on the New York Central between the Grand Central Station and 138th street, New York, or on the Pennsylvania between Broad street, Philadelphia, and Mantua Junction, where the speed must always be as high as possible. The difference between two seconds and five in such a matter no doubt has a decided influence on the endurance of the men.

Mr. Crocker's account of the relations between his railroad and the government is an able document. No one will deny that it is vigorous and forcible. More than that, it is in one sense truthful. In almost every detail on which he takes issue with the representatives of the government or the opponents of the company, he is right and they are wrong. Yet when we come to compare Mr. Crocker's work with that of a man like Mr. Adams, one fundamental difference is to be seen which goes far to justify the different way in which the two men are regarded by the public. Mr. Adams speaks as the representative of the investors in the Union Pacific, trying to do the best he can for their interests. Mr. Crocker speaks as an official, bound to do his duty under the law, and intending to do so, but not recognizing the moral responsibilities beyond the mere letter of the law. Look at the difference of attitude toward the small stockholders. Mr. Crocker defends them against the United States perhaps no less forcibly than Mr. Adams does; but the former does it on purely technical grounds, the latter on wider grounds of public policy. Mr. Crocker tries to secure them their technical rights for the present; Mr. Adams tries to give them the security of holding their property in the long run. The government made certain arrangements with the Central Pacific, whose effect was modified by the Thurman act. When that act went into operation much of the Central Pacific stock was sold to small investors. By and by it turned out that that act did not give the permanent security which was supposed. In the meantime the Central Pacific authorities had largely sold out their interests, and had become interested in a rival line, which leased the Central Pacific. Whoever suffered if the permanent interests went to ruin, they probably had escaped. When the authorities of one line are still more strongly interested in a rival line, they cannot complain if people regard their acts with suspicion. The authorities of the Central Pacific Railroad are in just this position. It may make their technical arguments easier; it makes it harder for them to satisfy the public. There is good reason for this. Mr. Adams

was right when he said that the best protection for the interests of the United States Government was to have the Pacific railroads held by small investors. That state of things insured careful management of the property rather than speculative management; it made it likely that the railroad would be run with permanent ends in view instead of temporary ones. It thus gave the public the security which it could have in no other way. Now that system of management which Mr. Crocker represents, under which the control of one property is in the hands of men who are interested in another, tends to produce precisely the opposite effect. We do not wish to prejudge this case, or to say that the Southern Pacific has used its power in this direction. But it is in a position where it has at once the opportunity and temptation to do so; and the public understands that this is the case.

We give in another column some figures showing the results of the trial of the per diem system of settlement for car service. These figures prove, so far as a single month or two can be taken as a basis, that there has been an increase of about four miles per car per day (say 20 per cent.) in car movement, and a decrease of one day (15 or 20 per cent.) in detention.

To get one-fifth more work out of a certain equipment and in one-fifth less time is a great improvement, and as the methods adopted for hastening the movement of cars have doubtless been far less efficient than they would be after a year's experience, it would seem quite reasonable to assume that this ratio can be maintained, if not further improved. But just as we hear of these hopeful indications it is announced that the Philadelphia & Reading, New York Central, Fall Brook and Beech Creek roads have backed out and returned to the old system. The unfavorable change in the balances has been too great for their courage. Car service reform, like civil service reform, meets with adverse winds in numerous quarters. Practical railroad men (who must make this quarter's earnings appear satisfactory) are like "practical" politicians, in that they are "in favor of the law but agin its enforcement." It is said that if the Time Convention had made a strong recommendation many new roads would have come in and made the system a success, and that the roads now changing would then have remained in. But this seems doubtful. The various obstacles, one of which we alluded to in our last issue, would show themselves in many places even if per diem were universal. Indeed, we understand that one of the difficulties that precipitated the present action was a disagreement as to what proportion of the cars for a certain joint traffic should be provided by the respective companies. Each desired to put in more than the other would agree to. But this is a question that should be settled on its own merits. The per diem system is not properly to blame for it. This, like the terminal charge question referred to last week, ought to have been settled long ago, but now it seems that the reform must wait while these points are discussed. Managers apparently just begin to realize what poor supervision they have heretofore given to this department. That a road will want to lend its own and avoid borrowing foreign cars is just as natural and inevitable under the per diem system as that a merchant should wish to buy low and sell dear.

The antagonism between the traffic and the operating departments is another of the difficult problems that must be met. It will not solve itself. General managers must show that they really control both departments. If freight agents cannot get business without giving away the use of cars as storehouses as an inducement, let them take the responsibility. They should at least know the magnitude of the expense they are incurring; therefore let the account be kept. Then if it be deemed best not to collect demurrage from consignees, charge it to the expenses of the traffic department. The reduction of the capital invested in cars on a single road by several hundred thousand dollars is too important an item to be given up without a protest.

The New York & New England, whose manager, Mr. W. P. Shinn, has made elaborate and independent studies of per diem methods and the whole car service system, just now announces its adoption of the new plan.

The daily papers of April 28 announced that committees of the directors of the Providence & Worcester and the New York, Providence & Boston (Stonington Line) had agreed upon a 99 years' lease of the former to the latter at ten per cent. on \$3,500,000 capital (\$500,000 more than the amount now outstanding). The full board of the Worcester road has approved the agreement and called a stockholders' meet-

ing for May 17. The rental named, with \$74,520 interest on the \$1,242,000 bonds, would make the annual charges \$424,520. The net earnings last year were \$439,000, and 9½ per cent. dividend was paid, though for the seven previous years the average net was only \$327,000, and the dividends were uniformly six per cent. The road is in fine condition, and is doubtless capable of yielding large earnings for many years. It has a great local business, manufacturing villages being strung along in sight of each other for 20 miles from Providence; and it is the shortest line from tide-water to Worcester, with its 80,000 population and a large tributary area, as well as a link in the cheapest route from the coal fields to this territory. The reasons in public policy, however, for objecting to so long a lease at so high a rate are as weighty as in the recent case of the Boston & Providence. The immediate reason for the Stonington road's desire to get control of the Providence & Worcester seems to be the feeling that the Boston & Providence, in the hands of the Old Colony, is liable to prove an unfriendly connection, and perhaps some day disturb the Boston-New York Shore line passenger traffic, which is the Stonington's main reliance for through business. The Providence & Worcester will connect it with the New York & New England at Valley Falls, six miles north of Providence, though a portion of this distance is used (and we believe owned) jointly with the Boston & Providence. The distance from Providence to Boston, by way of the New York & New England line from Valley Falls, is 48 miles, and the road is inferior to the Boston & Providence in grades, terminal facilities and other features. Perhaps, however, the chief significance in a change of control of the Providence & Worcester lies in the possibility of still further consolidation. At its northern terminus it connects with the Boston & Maine, and in new hands it may very likely be joined with the latter to make a strong line from North-eastern New England to New York city. The building of a bridge at New London is now assured, so that an all-rail passenger line can be made with the New York, New Haven & Hartford. The distance from New York to Worcester is about forty miles further than by the Springfield line, but the route would not be without its attractions. The New York boats from Stonington are already controlled by the road. A boat transfer between the New York & New England and the Boston & Maine across Boston harbor is mentioned, and would be possible, but whether the amount of business which it is possible to secure for such a through line would warrant the large investment necessary to transfer passenger cars is doubtful.

Adhesion and the Wear of Tires.

The subject of the wear of tires is one that has recently excited much attention, and the relative wear of thick and thin tires has been especially a debatable point. It is, however, evident that the relative economy of thick and thin tires largely depends upon the mileage or life of a tire. If a driving-wheel tire 3 in. thick would outlast the locomotive itself, tires 4 in. thick would evidently be wholly unnecessary. It is also obvious that if a 3 in. tire could be made to run as long as a 4 in. tire, the user could afford to pay a higher price per ton for the thinner tire and would save something in the cost of turning, etc., and would gain an advantage in the diminished number of days during which the engine was laid off. It, however, hardly needs any argument to show that any comparatively simple and inexpensive means of increasing the life of tires of ordinary thickness is preferable to using extra thick tires. That some improvement in ordinary practice as to the mileage of tires is possible is shown by the following example:

Two passenger engines built by the Rogers Locomotive Works for the Cumberland Valley in April, 1881, and April, 1882, respectively, have just made an exceptional record as regards mileage of tires. One of these engines ran 169,140 miles before the first turning, and then 96,070 miles and 89,487 miles before the second and third turnings respectively. The other engine ran 329,009 miles before the driving tires were turned, and it is stated that templates tried on the four quarters of the wheels showed the tires to be less than 1/16 in. out of round in the part most worn. The tires were made by the Midvale Steel Co., of Philadelphia. These engines have 63 in. drivers, 16 × 22 cylinders, and the weight on the four drivers is 46,550 lbs. The maximum grade going west is 45 ft. per mile, and going east 40 ft. per mile. The sharpest curvature is 5 degrees, but the general curvature does not exceed 3 degree curves. The average rate of speed on the road is 45 miles per hour.

We understand that the roadbed is good and that

the engines were carefully handled by experienced runners. The conditions were therefore favorable to a long life, but nevertheless the performance is very remarkable, and it would be interesting to know whether these tires were of exceptional quality, either as regards chemical composition or mechanical treatment in rolling. If all tires could be made to give such excellent results, one of the largest items in locomotive expenses would be greatly diminished.

Undoubtedly the wear of tires is often increased by preventable causes which have nothing to do with either the quality of the tire or the frequency or sharpness of the curves on the road. Some of these preventable causes of wear were alluded to in a recent issue, but possibly one of the most serious causes of wear is slipping. This is now generally understood, and in locomotives built during the last few years the amount of adhesion weight has been greatly increased in proportion to the cylinder power. This has largely diminished slipping, but a great many over-cylindered engines are still running, and though they may be in many cases improved by the addition of dead weight in the shape of cast iron foot plates, etc.,* in some cases the springs, axles, etc., are hardly strong enough to bear any material increase of weight. It is, therefore, not surprising that many efforts have been made to prevent slipping by various means which do not increase the adhesion weight. The first and most important is doubtless careful handling on the part of the engine runner. Almost any engine can be made to slip by injudicious handling, and many men in charge of locomotives appear to be indifferent whether the engine is slipping or not. Many runners permit their engines to slip and apply sand while steam is on and the engine is still slipping, and the result is that both tires and rails are abraded. A small amount of sand applied before the wheels commence to slip will generally prevent slipping and is more effective and damages the tire less than a large quantity of sand applied after slipping has commenced.

Some amount of slipping is, however, unavoidable, unless the supply of sand is always dry and can be delivered on the rail with certainty in stormy weather. If the stream of sand can be blown or washed aside, it is obviously of little use. Many endeavors have been made to effect improvements in the direction of applying sand with greater certainty, but until lately devices for this purpose have not come into extensive use. Recently, however, experiments on a large scale seem to show that a jet of compressed air or steam can, by means of suitable apparatus, be made to deliver a fine stream of sand on the rail just in front of the driving wheels in all weathers, and that slipping is thus entirely prevented. A valuable addition will be added to our present appliances for railroad working, if further experience should prove that the principle of blowing sand on the rail secures a reasonable amount of adhesion under unfavorable conditions and that the apparatus is simple and not likely to get out of order.

Another and totally different method of increasing the co-efficient of adhesion has been recently patented. Mr. E. E. Ries, of Baltimore, proposes to pass an electric current between the driving wheels and the rail. It is stated that experiments show that the adhesion between surfaces in rolling contact is increased in proportion to the quantity of current. A low tension current is used and is generated on the locomotive by a dynamo. Sand is always more or less objectionable, as it increases the resistance of the train and the wear of the brasses, etc., and it will be interesting to ascertain whether the obvious complication of the electric apparatus will be offset by the advantages which it appears to possess over any method of sanding the rails.

Railroad Legislation in England.

Both the English railroads and the English public seem to be impressed with the smooth working of the short-haul clause of the Inter-state Commerce Act, and the principles laid down by the Commission in the Louisville & Nashville case. Two weeks ago "a large and influential deputation," consisting of the chairmen, solicitors and general managers of the principal railway companies in the United Kingdom, had an interview with the Board of Trade authorities with reference to the Government Railway bill. Mr. W. W. Thompson (the Chairman of the Railway Companies' Association) said that they had confidence in the Board of Trade.

"They believed that there was no difference in principle between them and the government as to the object to be

* Mr. Frank C. Smith (Peoria, Decatur & Evansville) stated recently that an increase in the adhesion weight in combination with some improvements in the blast pipe and chimney had increased the load hauled per ton of coal 21 per cent.

effected—namely, that the Commissioners should have ample powers to prevent any unfairness of treatment of any traders or districts, but that, subject to these powers, the railway companies should not be prevented from modifying their charges to meet the varying circumstances with which they had to deal, and that inequality of charge should not by itself constitute unfairness, when the conditions of trade were dissimilar, and where no competitive interests were involved."

Doubtless a part of this moderation of statement was due to the fact that one or two other bills were before Parliament containing more severe restrictions. But it is noteworthy that the English companies should have withdrawn from their traditional attitude of defiance and should have adopted almost the very words of our Inter-state Commerce Commission to indicate the line on which a compromise should be sought. Not less noteworthy is the editorial of the *London Times* in speaking of this meeting:

"At length," says the *Times*, "the railway companies seem to be discovering that legislation may assist, and not simply thwart; that it is for their own advantage to have an authoritative mediator between themselves and the public, and among themselves. The existence of the Railway Association, and the harmony with which its members work, are signs that railway chairmen and managers are beginning to perceive that they can be more powerful in combination than in conflict. They can hardly be said to have imbibed at all thoroughly as yet the analogous truth of the essential community of their interests and those of the public. Experience will show them that neither Parliament, nor the Board of Trade, nor the Railway Commission, nor the public itself has any wish to confiscate railway property. All which is demanded is that powerful corporations, invested with a substantial monopoly, shall not be judges in their own cause; that their isolated customers shall not be condemned to fight separately against them."

This statement contains a great deal of truth. Unfortunately, the existence of the clause against pools prevents us from coming anywhere near a realization of this ideal. Nor is it as universally true of our legislators as it is of the English that they have "no desire to confiscate railway property." But in general, what applies to one country will apply without much change to the other. If the English pass a law like our Inter-state Commerce act, minus the pooling clause, the railroads will probably find it more of a protection than a discomfort.

A Cotton or Grain Shipper's Dilemma.

It is customary for shippers of certain articles, especially cotton and grain, from the south and west to the east for export or for home consumption, to insure the same against loss or damage by fire or other casualty. These staples from time of sale at the first or baling point and before reaching destination are subject to many dangers from losses for which carriers are not responsible by the common law, and it is by most shippers considered good business policy to guard against such chances of loss by putting insurance upon the articles in some regular company.

The bills of lading issued by the railroad or water transportation companies for such shipments of cotton or grain contain the stipulation: "If the carrier shall become liable to pay anything on account of goods which have been insured, he shall, to the extent of such liability, have the rights of the insured against the insurer." This is sometimes more simply expressed thus: "The carrier shall have the benefit of any insurance upon the goods specified in this bill of lading." This stipulation has been sustained in all the courts. The latest decision is by the New York Court of Appeals in the case of *Platt vs. Richmond, etc., R. R. Co.*, decided Feb. 10, 1888. This was an action brought by the receiver of the Insurance Company of North America to recover from the transportation company the amount paid by the insurance company to the owner of cotton destroyed by fire. The Court says: "By a special stipulation in these bills of lading which is set up in answer, the defendant was entitled to the benefit of that insurance and payment by the insurance company. This discharged the defendant from all liability. By the express contract between the assured owners and the railroad company, it (the railroad) was to have the benefit of the insurance for its indemnity. If the insurance company had not paid the loss, upon payment by the defendant, it (the defendant railroad) would be entitled to the full benefit of the policy which assured had taken."

In the Circuit Court for Southern New York, May, 1884, in the case of *Rintoul v. New York Central*, this question was gone into more at length. The Court held that such a stipulation in the bills of lading was fair and was not an exemption from common law liability, as plaintiff had claimed, but merely same as an insurance policy taken out by the railroad. In the case of the *Phoenix Insurance Co. v. Erie & Western Transportation Co.*, the Supreme Court of the United States, in March, 1886, sustained all these points, so that the legality and effect of such stipulations in bills of lading are well established. The owner of cotton or grain which has been destroyed or damaged under circumstances rendering a transportation company liable for the loss, cannot recover from the carrier if the goods have been insured. The carrier is entitled to such insurance.

This being the case, the owner must, under these circumstances, rely upon the insurance company; but here again he fails. In the *Platt vs. Richmond* case referred to the Court says: "By a general rule of equity, when goods are totally

lost by perils insured against, the insurer, upon payment of the loss, becomes subrogated to all the assured's rights of action against third persons who are responsible for the loss, and the insurer has this right of subrogation without any express stipulation to that effect. It grows out of the very nature of the contract of insurance as a contract of indemnity."

Nevertheless, insurance policies do contain such stipulation. A common form is "when this company shall claim that fire, etc., was caused by act of corporation which created cause of action, the party * * shall assign to this company such cause of action." But, as we have seen, such assignment of his cause of action is the very thing the owner cannot make since he has expressly agreed with the transportation company that it shall have his assignment. This view has also been sustained by the courts. In the case of *Carstairs vs. Mechanics & Traders' Insurance Company of New York*, decided in the U. S. Circuit Court of Maryland, June, 1883, both the policy and the bill of lading contained the subrogation clause. The Court held that the carrier may contract with shipper for the benefit of his insurance, and also held that the agreement in the bill of lading prevented the shipper from subrogating his claims to the insurer, according to the terms of his policy, and hence there could be no recovery from the insurance company.

The shipper has made two contradictory stipulations, neither of which he can completely fulfill, and in consequence he has no claim for his lost goods upon either carrier or insurance company. And this dilemma is forced upon him under the very circumstances which should secure him easy indemnity, where the railroad company at common law would be clearly responsible except for the fact of the insurance. This possible loss of the entire value of a shipment is of interest to both consignors and consignees, and also to every bank handling drafts secured by bills of lading, which may turn out to be no security at all. The escape from this dilemma lies in having the carrier expunge the objectionable clause from the bills of lading. This has been done by some railroads, but the clause is still frequently retained.

American and English Freight Trains.

The high charges for freight on English railroads are not so surprising as the exacting demands made by freighters for high speed and punctuality. An English railroad officer informs us that in this respect competition has within the last few years taken a decided direction towards high speed and punctuality, while the questions of reduced or cut rates and pooling have remained in the background. Fast freight trains chiefly conveying fresh meat are run from Glasgow to London by the Caledonian and London & Northwestern route (405 miles) in 11 hrs. 30 min., an average speed including stops of 35.2 miles per hour. It appears that not infrequently a delay of even 30 min. in the arrival of freight conveyed between London and Scotland will cause a freighter to send his next consignment by a rival route. In order to meet the wishes of freighters and avoid any delay by transshipment very small consignments are allowed a whole "wagon," with the consequence that the average load per four-wheeled wagon in fast freight service does not average above 3,000 lbs., and is often below this figure. Reckoning the capacity of an English wagon at rather less than half that of an eight-wheeled car, the average load in American practice being about 18,000 lbs., the average load for the English wagon should be fully 8,000 lbs., or nearly three times the actual amount. This difference is surprising, and it would certainly appear that the gain in time cannot at all compensate for the diminished capacity.

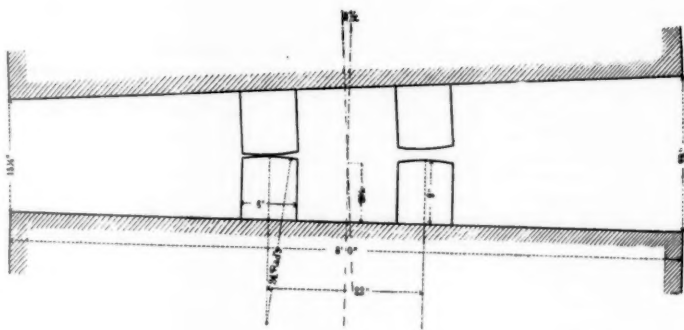
The maximum load for an express freight on the Caledonian with one engine is now 39 loaded wagons and a 10-ton caboose. The comparison between such a train and the average train on some American roads is indicated by the following figures, the average weight of an English wagon being assumed at 11,000 lbs., and that of our eight-wheeled cars at 22,000 lbs. each.

	Cleveland, Columbus & Cincinnati & Indianapolis.	Union Pacific.	Caledonian.
	No.	No.	No.
Number of loaded cars in train	21.4	21.03	39
Weight of cars empty	Tons * 257.4	Tons * 214.5	Tons * 214.5
" " engine and tender	70	70	80
" " caboose	10	10	11
Total dead weight	337.4	311.31	335.5
Paying load	210.4	159.5	67.2
Total weight train	547.8	470.83	372.7
Paying load per loaded car	9.00	7.59	1.65
Per cent.			
Paying load per cent. of total wt. train	38.4	33.9	18.3

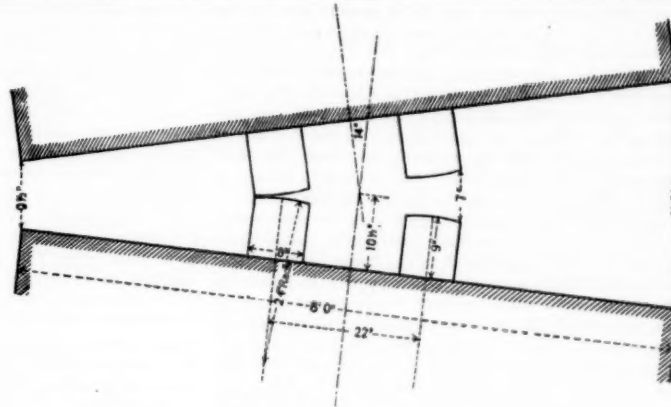
*Tons of 2,000 lbs.

It will be observed that the total weight of the empty cars and engine, etc., does not greatly differ in any case, but the amount of paying load shows an enormous difference. The nominal capacity of the American and English trains is about equal, for reckoning 40,000 lbs. for an American car and 19,000 lbs. for an English wagon, the average American train would carry about 440 tons, and the English train about 370 tons. The figures here given are probably characteristic of the roads of both countries, for while some American roads, the New York, New Haven & Hartford, for instance, have an average train load of little over 100 tons; other roads, such as the New York Central, Pennsylvania and Erie, have a larger average train load than that shown. On the other hand, many trains on the Caledonian and on other railroads in Great Britain have a heavier train load, but the average is probably but about 90 tons.

The Caledonian labors under the disadvantage of heavy gradients on both main line and branches, but the use of



Position on 10-Degree Curve.



Position on 38-Degree Curve.

PROPOSED M. C. B. STANDARD DEADBLOCKS ON CURVES.

double headers, or assisting or banking engines, is now confined to a long grade of 70 ft. per mile on the main line. The bad economy of light train loads is recognized, and though the actual increase in weight cannot be ascertained owing to the absence of ton mileage statistics, the receipts per freight train mile show some 5 per cent. increase during the last six months. The line was formerly worked entirely with four-coupled engines, but heavier and more powerful six-coupled engines have been introduced by Mr. D. Drummond, the present locomotive superintendent, who is President of the only society in Great Britain corresponding to our Master Mechanics' Association. It is confined to the five roads of Scotland, and the economy of compound locomotives and other questions are discussed at frequent meetings held at regular intervals.

The Position of Deadblocks on Curves.

The accompanying diagrams show the position on curves of freight cars fitted with deadblocks. The dimensions and position of the deadblocks are those recommended by the Executive Committee of the Master Car-Builders' Association. One illustration shows two cars on a 38-degree curve (150 ft. radius) and the other shows the relative position of two cars on a 10-degree curve (573 ft. radius).

Our illustrations of the M. C. B. coupler in a recent issue* showed the position assumed by two of these couplers when fitted to two 34 ft. cars standing on a 38-degree curve (150 ft. radius). The accompanying diagrams show the position taken by the deadblocks. The shaded lines represent the bodies or end sills on the supposition that this line coincides with the base of the deadblocks, and consequently when the cars are standing on a tangent the shaded lines are 18 in. apart when the draw springs are compressed and the deadblocks are in contact. It is of course hardly necessary to point out that the extreme projection of the body does not necessarily coincide with the base of the deadblocks, and that with cars with end platforms, the beveled ends of these sills will modify the distance apart of the end corners of the sills when the cars are standing on a sharp curve. The diagrams given do, however, show that the distance apart of cars as regards safety to the men is liable to be considerably diminished on sharp curves.

On a 38-degree curve the drawspring can only be compressed $\frac{1}{4}$ in., and the corners of the car approach within 9 in. of one another, a distance which can hardly be regarded as altogether safe. Fortunately 38-degree curves are rarely used even in sidings or yards.

The other diagram shows two cars on a moderate curve for sidings, 10 degrees or 573 ft. radius. The distance between the corners of the car on the inside of the curve is not very materially diminished.

Some Annual Reports.

Norfolk & Western.—The operations of this road make a remarkably good showing. Without any great increase in mileage (527 miles operated in 1887, against 509 in 1886) the increase in traffic has been enormous. The figures for a series of years are so remarkable that we cannot refrain from quoting them in full:

Year.	No. of passenger miles.	No. of tons.	Tonnage mileage.
1881.....	215,904	13,074,204	538,102
1882.....	263,347	14,915,267	609,727
1883.....	307,927	16,285,288	797,255
1884.....	412,452	19,213,251	892,512
1885.....	388,087	19,151,544	1,199,790
1886.....	400,769	19,580,000	1,555,867
1887.....	558,951	26,703,579	2,308,688

The increase in mileage in six years was but 24 per cent. In the course of this period passenger receipts per mile have been reduced from 3.97 cents to 3.04 cents, and freight receipts per ton-mile from 1.45 cts. to 0.63 ct. This is the more remarkable since the proportion of local traffic has been increasing instead of diminishing. It shows what can be done by a judicious policy in this respect. This great reduction in freight charges has been chiefly due to the development of local mineral traffic and particularly of coal. In 1882 the road carried less than 5,000 tons of local coal and no coke at all; in 1887 this traffic furnished half the freight of the road—more than a million tons in all. The company added to its equipment in 1887, 47 locomotives, 13 passenger cars, 45 caboose and road cars, and no less than 1,434

freight cars; an increase in the last item of more than one-third. And they say that they could have used more cars if they had had them.

The gross earnings of the company increased 31 per cent. in 1887 as compared with 1886, and the net earnings 37 per cent.—in spite of the fact that unusually large sums out of current income were charged to maintenance of way. Fully three-fourths of the earnings were from freight. The revenue account is as follows:

Gross earnings.....	\$4,254,794
Operating expenses, including taxes.....	2,483,780
Net earnings.....	\$1,771,014
Other income.....	101,648
Total interest charges.....	1,337,134

Surplus for the year 1887..... \$635,528
This would amount to nearly 3 per cent. on the preferred stock; but they did not divide any of it. Nor ought they to have done so while the capital account of the road is in its present condition.

This is the weak point of the Norfolk & Western. It is capitalized at \$100,000 per mile of line in operation; in round numbers \$7,000,000 common stock, \$22,000,000 preferred stock, \$22,000,000 funded debt and \$2,000,000 other debts, \$53,000,000 for 530 miles of line. So long as matters are in this shape, it becomes the directors to pursue a most conservative policy in the matter of dividends.

Grand Rapids & Indiana.—From the full and well arranged statistics published by this company, we take the following statement of operations for all lines:

	1887.	1886.
Earnings, freight.....	\$1,888,887	\$1,610,558
passengers.....	937,120	783,519
Total, including miscellaneous.....	\$2,825,557	\$2,394,077
Operating expenses.....	1,984,110	1,965,459
Net earnings.....	989,847	869,717
per mile.....	1.720	1.650

The financial statements for the different properties are separately given. It would take too much space even to present an abstract of them—particularly as the mileage (557½) has remained unchanged and the capital accounts are but slightly modified.

The gain over 1886 is in the passenger business. The net freight revenue of the main line shows a slight decrease. This is the more noticeable because there was an increase of 19 per cent. in the volume of traffic handled. But there was a decided decrease in receipts per ton-mile (from 1.137 cents in 1886 to 1.083 cents in 1887) and an increase in expenses per ton-mile from 0.726 cent to 0.743 cent. The increase in expenses is more surprising than the decrease in average receipts.

It seems to have been chiefly due to two causes; first, the shorter average haul in 1887, and, second, the larger proportion of parcel freight. Good economy in making up trains was not sufficient to offset the loss from these causes. We give a few illustrative figures:

	1887.	1886.	Inc. or Dec.
Freight revenue.....	\$1,513,330	\$1,330,488	\$182,842
Freight expenses.....	1,038,581	849,973	188,608
Net freight revenue.....	474,758	480,515	D. 5,757
Per cent of exp'to earn'g.....	68.62	63.88	I. 4.74
Freight train mileage.....	1,118,357	986,975	I. 131,382
Ft. train earnings per mile.....	\$1.35	\$1.35	I. \$0.07
Ft. train profit per mile.....	.83	.86	D. 0.07
Ft. train profit per mile.....	.45	.49	D. 0.07
Tons frt. handled per mile.....	139,691.801	116,932.107	I. 22,759.694
Earn. per ton per mile.....	1.083 cents	1.137 cents	D. .054 cent
Exp. per ton per mile.....	.743	.726	I. .017 "
Net rev. per ton per mile.....	.340	.411	D. .071 "
Av. ton haul, all freight.....	117. miles	128.9 miles	D. 11.9 miles
Av. number tons per car.....	11.24	10.38	I. .86
Av. number tons per train.....	124.91	118.49	D. 6.42

Chicago, St. Louis & Pittsburgh.—The financial showing is as follows:

	1887.	1886.
Earnings, freight.....	\$4,314,564	\$3,448,447
passenger.....	1,157,822	1,036,165
Total, including miscellaneous.....	\$5,887,181	\$4,484,316
Operating expenses.....	4,311,165	3,960,301
Net earnings.....	1,576,016	870,015

The charges against net earnings for interest, rentals, etc., were \$1,236,017, leaving a surplus for the year of \$340,000, in place of a deficit of \$315,000 in 1886. This is a remarkable advance. The only point in the charge to which any exception can be taken is a small reduction in the amount expended on track maintenance (steel rails and ballast), and this is too slight to seriously affect the general result.

The mileage has remained unchanged—580½ miles of main line and 55 miles operated jointly with the Lake Erie &

Western. The capitalization of the road has increased (through purely financial operations) about a million and a half during the year. The liabilities now are, in round numbers, common stock, 9 million dollars; preferred stock, 17½ million; funded debt, 18½ million; current liabilities, 2½ million; total, 47½ million.

The account of operations is in every respect good. The percentage of operating expenses to earnings has fallen from 81.9 to 73.2. The number of tons carried increased 15 per cent.; the number of passengers 9 per cent. The average rates per ton and passenger mile were a trifle higher, the length of haul remained practically unchanged; the train loads were most decidedly increased—from 209 tons to 229, and from 29 passengers to 31. All this much more than counterbalanced the increased price of coal and specially large repairs of freight locomotives, which were the most important items of increased operating expense.

Denver & Rio Grande Western.—This company was under the control of the D. & R. G. till 1884. When the D. & R. G. was unable to meet its obligations, this (Western) company went into the hands of a receiver. It is less than two years since it was taken out of his hands. The second year can hardly be called encouraging. The gross earnings show an increase from \$1,057,000 in 1886 to \$1,181,000 in 1887. Unfortunately the operating expenses increased in the same period from \$699,000 to \$839,000. The net earnings therefore show a reduction from \$361,000 in 1886 to \$342,000 in 1887. This sum is sufficient to meet the existing obligations of the company and leave a surplus of about \$75,000 annually; but by the reorganization agreements the annual charges in 1890 will increase to nearly double their present figures, and the net income will have to be greatly increased in order to meet them in any way. The one encouraging feature in the case is the large increase in local business. This is the more important, because it seems unlikely that the company will be in position to widen its gauge for the present; so that its local traffic is not merely important but all-important.

Central Pacific.—The report for 1887 is in much better form than for previous years; so much better as to be in some respects a source of embarrassment, on account of the difficulty of comparing it with its predecessors.

For three years past the railroad has been leased to the Southern Pacific at a rental of not less than \$1,200,000, to be increased to \$1,360,000 on the completion of certain extensions now just opened. The net earnings this year did not suffice to meet the fixed charges and the rental; that is, the Southern Pacific lost \$113,000 on the contract. The figures are as follows:

Year ending Dec. 31, 1887:	
Gross earnings.....	\$13,737,845
Operating expenses, taxes, rentals and interest on floating debt.....	7,969,202
Interest, sinking fund and U. S. requirements.....	4,461,030
Betterments paid by South Pacific.....	220,880
Net profit under lease.....	1,086,733

Against a guaranteed rental of \$1,200,000. Last year the net result was \$1,324,998, showing a change of about a quarter of a million for the worse. The details are not in such form as to be available for direct comparison, but it may be said without serious error, that both the earnings and the expenses have increased from one and one-half to two millions in 1887 over 1886.

The increased expenses are due largely to two causes; first, increased amounts spent for maintenance of way, and second, largely increased cost of fuel. This last item has increased from \$962,000 in 1886 to 1,617,000 in 1887; an addition of two-thirds to the previous amount. The matter is equally striking if compared with the train mileage. The cost of fuel per train-mile in 1886 was 15.82 cents. In 1887 it increased to 21.25 cents. On all these details the General Manager's report gives full and good information. Unfortunately this report quite fails to connect with the financial statements which were published in 1886, and, therefore, cannot be used to throw much light on the history of the company.

A large section of the report is devoted to an account of the relations between the Central Pacific and the U. S. Government. This we have noticed in another column.

The extensive additions which the Manhattan (elevated) road, of New York city, has been making to increase its facilities for rapid transit, are now substantially completed and in use. On the Third avenue line between Ninth and

* See page 249 *Railroad Gazette*, April 20, 1888.

Fourteenth streets and on the Sixth avenue line between Chambers and Grand streets, where the main tracks are on the line of the curbstone and thus a considerable distance apart, the space between them has been filled up with additional tracks, in some places one and in others two, the transverse girders from one main track to the other being strengthened so as to support the new tracks. About 3,000 ft. of these tracks have been laid, and they are used to back off trains which make short trips. The constantly increasing travel, which has now reached a constant average of 500,000 persons per day, has made the problem of furnishing seats impartially a very difficult one. Although all comers have been carried with reasonable dispatch, it was inevitable that passengers boarding the trains at the termini, or within one or two stations from the starting point, especially at the down-town stations during the evening rush for home, always had the best chance at seats; and those getting on at points further up-town, such as Grand, Franklin and Chambers streets, on the west side, and Houston and Ninth on the east, always had the privilege of standing up. By the aid of the new side-tracks, however, trains have now been run for a considerable time, starting (on the Third avenue line) from Ninth street northward, thus putting that station and a few adjoining it on the north on an equality with the southern terminus as regards choice of seats. On the Sixth avenue line trains start from Franklin street, six of them being run from that station during the busy evening hour. The running of the short trip trains is also an advantage in the morning, as the stopping of a portion of the southbound trains at Franklin street relieves the congestion at Rector street and South Ferry stations. The adequate handling of the traffic in the morning depends largely on the facilities with which trains arriving at the southern termini can be unloaded and started back for a second trip. For some time past trains have been run so closely together that at Rector street two trains were discharging passengers at once a good share of the morning hours. This necessitated the use of the northbound platform for one of the trains, and northbound through trains were thus constantly hindered more or less. The experience of the Manhattan goes to show that the running of express trains or the omission of a portion of the stops for the purpose of eliminating unequal conditions as between different stations is a device that can be employed on a crowded line only with difficulty. Practically, the only feasible plan is to have every train stop at every station as far as it goes.

A large quantity of new 70-lb. rails has been laid this season, replacing those weighing 56 lbs.

Mr. Whitney, Mechanical Superintendent of the Intercolonial Railroad, is about to try high pressure steam on rather an extensive scale. Fourteen American type engines, with 175 lbs. boiler pressure are being built for this line at the Canadian Locomotive Works, Kingston, Ont., and four locomotives of similar dimensions are being built by Messrs. Dubs & Co., at Glasgow, Scotland. These engines will have 18 by 24 cylinders, and 62-in. driving wheels, and will weigh in working order about 95,000 lbs. The boiler plates in the shell will be $\frac{3}{8}$ in. thick, and apparently considerable pains has been taken to make the engines thoroughly substantial and durable. Both the truck and the driving wheels are of wrought iron, steel tired. The truck wheels are made by coiling a long wrought-iron bar upon itself and welding it into a disk, while the driving wheels are made of wrought-iron spokes in the style usual in Europe, rim and hub being welded together.* Both truck and driving wheels are made by Krupp, of Essen, Germany.

This is a somewhat novel departure, for though wrought-iron centres are very generally used for truck and tender wheels, cast iron has been used for drivers except in rare instances, some of the Pennsylvania Class K engines having wrought-iron driving wheel centres. Though a wheel built up of wrought iron contains a great many welds, it has no hidden blow holes, and is not subject to sudden failure, any defects increasing slowly and giving ample warning. The saving in weight and the greater elasticity of the wrought-iron spokes will probably contribute to lengthen the life of the tire, for experiments on a large scale have shown that the rigidity of the material used for the body of the wheel has a marked effect both on the durability and freedom from breakage of the tires.

The New York Times, in a recent issue, publishes a communication from Washington concerning the relations of the government to mail-carrying railroads. The communication makes the general claim that the rates paid the roads are much too high and that the recent proposition for a reduction of letter postage to one cent per ounce failed only because of this large item in the expenses of the Post-Office Department. Figures are quoted showing the reductions made in average freight rates on prominent roads during the last ten or fifteen years. The poorer and less prosperous roads are not referred to. These reductions range from 25 to 50 per cent. Reductions in the average receipts per mile per passenger are also given for various roads, four large western lines showing reductions of 19, 24, 30 and 37 per cent. During the past fifteen years the reduction of compensation for carrying the mails has been about 15 per cent., but it is claimed that the high rates since paid for the use of postal cars have virtually restored two-thirds of this reduction. The average payment for carrying the mails was: In 1873, \$114 per mile; in 1880, \$123, and in 1887, \$133. The \$300,000 annually paid for extra speed is said to go mostly to roads in the South.

The trouble with this criticism is that it deals only with

* This method of making wrought-iron wheels was described in the Railroad Gazette, May 2, 1885.

averages and gross amounts. The prices paid for postal cars should be based largely on the size and weight of the car, as the trip has to be made, and costs substantially the same, whether the mail transported weighs ten pounds or ten tons. As the facilities of this kind furnished by the roads have been greatly enlarged in the last 15 years, there is no evidence that the increased payments have not been earned. The increase per mile in total expenditure, whether it is only for mail by the pound or includes also the sums paid for postal car space, is very likely warranted by increased quantities of mail carried. While the total amount paid out by the government may be high, or even too high, the employment of a rigid and uniform rate based on averages doubtless works injustice to many roads, some getting more than a reasonable rate and others less. A rational principle as a basis is the first desideratum. Most of the reductions made in freight rates have been forced by competition. As the transportation of the mails is compulsory there is no equity in demanding that the profit from it shall be as small as on freight.

A paper in a recent issue of the *Stevens Indicator*, by Mr. D. S. Jacobus, contains an interesting discussion of the economy due to the use of an injector, in comparison with a direct-acting steam-pump, both with and without a feed-water heater, and a geared pump with heater. Although the investigation is theoretical, it seems to be based on reliable data, so that the results, as summarized by Mr. Jacobus in the following table, differ little, in all probability, from the figures which would be obtained by actual experiment:

Manner of feeding boiler.	Temperature of feed-water, Fahrenheit.	Relative am'ts of coal required for feed apparatus, in equal times.	Per cent. of fuel saved over first case.
1. Direct-acting steam-pump, no heater	60°	100	0.
2. Injector, no heater	150°	98.5	1.5
3. Injector, with heater	200°	93.8	6.2
4. Direct-acting steam-pump, with heater	300°	87.9	12.1
5. Geared pump, actuated by the main engine, with heater	200°	86.8	13.8

Mr. Jacobus does not make the comparison between the economical performance of an injector and pump actuated by the main engine, without heater in each case, or, in other words, he does not consider one of the most general divisions of the problem. Some experiments made on the Illinois Central R. R. (see *Railroad Gazette*, May 19, 1876) may be briefly cited to supplement the discussion. The figures given represent averages of 8 trips of 128 miles in each case:

	Feeding with pump.	Feeding with injector.	Per cent. of gain for injector.
Pounds of coal per trip	9,529	8,736	9.08
Pounds of water per trip	48,888	46,826	4.04
Pounds of water evaporated per pound of coal	5.14	5.26	4.28

In the experiments with pump, the trains were slightly heavier than when the injector was used, and more time was lost in switching and standing, for which reason the experimenters considered that the economy of coal consumption for the injector should be reduced from 9.08 to 6.21 per cent. Some incidental advantages were observed in the case of the injector, the boiler steamed more freely and there was less variation of pressure.

It is well known probably that Michigan is one of the states showing a coupler law. Under the act of 1885 railroads were required to put some form of automatic coupler on all new cars and on cars sent in for repairs, and the Commissioner selected seven couplers as fulfilling the requirements for safety. By an amendment passed in 1887, the railroads are allowed to use any coupler which comes up to the standard fixed by the act of 1885 and which is approved by the Commissioner. Up to the present year the Commissioner had not made a point of helping the M. C. B. type, and in fact had declined to approve the Janney. Within the last four months, however, he has approved both the Janney and the Dowling, and we may suppose that any coupler of the M. C. B. type will be approved as well. Of the seven couplers recommended in 1886 but one was of the vertical plane type. Therefore it is not supposable that this type can have made much progress in the state. Among the couplers approved in 1886 was the Marks, which was also recommended by the M. C. B. committee in that year for further trial, and is still authorized for use in Michigan. We learn that the Flint & Pere Marquette has officially adopted this coupler, and now has 3,000 cars equipped with it.

A form of insurance which is not new in England, but which has been in operation in the United States little more than a year, we believe, is that carried on by the Employers' Liability Assurance Corporation. The object of this company is to insure employers against all risk arising from injury to employes received in their service. The system has been carried on with great success in England, and for something more than a year a branch of the English company has been established in the United States. From the standpoint of the employers it would seem probable that such an organization for insurance against loss from injury to workmen would be an excellent institution, but we very much doubt if it would be so regarded from the standpoint of the

employé. While the employer must frequently have a considerable incentive to be not only just but generous towards men injured in his service, a third party insuring him against such risks could have no other motive than to avoid the payment of every possible indemnity, and it seems to us that farming out this part of an employer's responsibility must have the effect of making the relations between employers and employed even less friendly than they now are. This system of insurance originated, we believe, in England shortly after the passage of the act, greatly increasing the liability of employers, and the recent enactment of a similar law in Massachusetts doubtless prompted its introduction into this country. At least the chief office of the United States branch of the English company is in Boston.

The stock and bonds of the Chicago elevated railroad, of which the name is the Chicago & South Side Rapid Transit Railroad, are now offered in the market to the amount of \$9,000,000, and it is said that eight miles of the road is under contract for construction. The contractor is the Rapid Transit Bridge & Construction Co., of New York, and the securities are offered for sale for the account of this company. The city of Chicago lately granted to the railroad company the right to construct and operate an elevated railroad within the municipal limits, and to secure by purchase or condemnation, and to own a right of way 30 ft. in width along its entire route, except where intervening streets are crossed—greater widths being permitted where needed for stations, etc. The portion of the railroad now under contract for immediate construction begins at Van Buren street, runs due south for nearly four miles, adjacent to State street and Wabash and Michigan avenues to the present southerly limit of the city of Chicago, and thence for four miles through a populous and growing suburb. The grant to the company permits it to build and operate three tracks. It is intended at present to build two tracks only. The securities to be issued on this 8-mile section amount to \$15,000,000.

The ordinance authorizing the occupation by the Philadelphia & Reading Terminal Co. of certain streets in the city of Philadelphia was introduced this week in the Select Council of that city, and referred to the Committee on Railroads. The protest against the construction of this road which was adopted at a public meeting, April 17, and signed by H. C. Lee, as chairman, and Elliston P. Morris, as secretary, was presented at the same session and also referred to the Committee on Railroads. The ordinance provides that the work shall be begun within six months, and completed within three years. All the crossings over streets shall be constructed under the supervision of the Chief Engineer and Surveyor of the city, and all street crossings must be lighted by electric lights. The structure must be elevated throughout, but may be built of either masonry or iron. All existing tracks crossing Broad street other than the two northernmost ones which lead down Noble street shall be abandoned and taken up. The cost of the revision of street grades, including all damages, is to be paid by the railroad company, which must give bonds in the sum of \$250,000 to compensate the city for any loss or damage.

The Pennsylvania has declared a semi-annual dividend of 2½ per cent. Last November a 3 per cent. dividend was declared, making the dividends for 1887 5¼ per cent., instead of five, as has lately been customary. The earnings for the last two months of 1887, and the first three of 1888, are considerably decreased, as compared with the previous corresponding period. The decrease in the first three months of this year is \$991,000 on lines west of Pittsburgh, and \$175,000 on the eastern lines. The capital stock on which the dividend is now paid is \$106,543,200, an increase of \$8,023,200 over that of a year ago.

Judges Gresham and Blodgett have granted a temporary injunction restraining the Wagner Co. from using the Vestibule on their trains, stating that is a duplicate of the Sessions patent as used on the Pullman Vestibule trains. It is understood, however, that the infringement practically is confined to the buffers and springs used in connection with the Vestibule. Judge Gresham upheld the validity of the Sessions patent, and said that none of the previous patents were intended to prevent vibration and oscillation and that none embodied the substantial features of the Sessions invention.

TRADE CATALOGUES.

Facts as to the Sprague Electric Motor is the title of a neat little illustrated pamphlet giving particulars of some of the various applications of this motor, working elevators, tramways, mining drills and pumps, running a transfer table at the Chicago, Burlington & Quincy shops at Aurora. It is said that the motor does this work with entire satisfaction to all parties, moving over one hundred tons. The table is 66 ft. long and has a tractive resistance, when full loaded, of about 1,500 lbs. It weighs, light, about 15 tons.

True Inwardness by an Honest Man.—This whimsical title adorns the cover of a catalogue of the drill presses, cutting off tools and other specialties made by the firm of Sterling Elliot, of Newton, Mass. The illustrations and descriptions of machine tools, etc., are interleaved with humorous pictures representing the interior of a small shop during the dinner hour, the way in which the nice behave whilst the cat is away on a visit, and the aspect of the down trodden, horny-handed son of toil when the boss is away hunting up orders.

The following lines of poetry, which have been variously

attributed to Homer, Shakespeare, Donnelly and Jay Gould, form an appropriate preface:

Shops of great men oft remind us
We may make our own unique,
And departing leave behind us
Roofs which never had a leak.

And

Business which, perhaps, another,
Working in the self same line,
Some forlorn and bankrupt brother,
Seeing, shall take down his sign.

TECHNICAL.

Locomotive Building.

The Brooks Locomotive Works, of Dunkirk, N. Y., have delivered eight locomotives to the Duluth, South Shore & Atlantic. The Baldwin Locomotive Works have also 30 locomotives under contract for the same road.

Car Notes.

The Wason Manufacturing Co., Brightwood, Mass., has an order for a palace car for King Luis I. of Portugal. It will cost about \$18,000, though the designs are not yet fully completed.

The Ohio Falls Car Co., of Jeffersonville, Ind., has just completed four passenger cars for the Louisville Southern.

Twelve freight cars have just been completed at the Macon shops of the Central of Georgia to be used on the Columbus & Western.

The Jackson & Sharp Co., Wilmington, Del., is building a number of passenger cars for the Western Maryland and Duluth, South Shore & Atlantic roads, and has also just shipped 20 first-class passenger and three baggage and mail cars to the Louisville Southern and three passenger cars to the Cape Fear & Yadkin Valley.

Thirty new passenger coaches just delivered to the New York Central are equipped with the improved Westinghouse automatic brakes, the Martin system for steam heating, high-back tilting seats and superior facilities for ventilation. 36-in. steel-tired wheels, and unusually large springs to promote easy riding. The coaches will be introduced at once into regular service on the various divisions of the New York Central.

The West Shore has just put in service 200 stock cars equipped with the Westinghouse air brake and the Janney and Dowling couplers.

The car shops of the Alice Furnace Co., at Birmingham, Ala., have built during April, 15 iron cars, which are to be used by the company in the transportation of heated cinder from the furnaces to the slag pile. They have now nearly 50 cars in use for this work alone. An additional switch engine, which has just been rebuilt by the Linn Iron Works, was put into service last week.

The Terre Haute Car & Manufacturing Co., of Terre Haute, Ind., is working on an order for 1,000 freight cars for the Chicago & Northwestern.

The Bangor & Piscataquis has placed an order with the Portland Co., of Portland, Me., for 10 freight cars.

The Lafayette Car Works have shipped to the Duluth, South Shore & Atlantic 10 cabooses of their order for thirty.

The Indianapolis Car Mfg. Co., of Indianapolis, Ind., has commenced work on an order for 300 box cars for the Louisville Southern, and when this is completed will commence work on an order of 300 cars for the Pittsburgh & Western.

The Marietta & North Georgia is negotiating for standard gauge passenger cars.

The Tredegar Co., of Richmond, Va., shipped to the Georgia Pacific last week 50 ore dump cars of 60,000 lbs. capacity.

Bridge Notes.

The Wisconsin Bridge Co. will be organized by George Weinhagen, of Milwaukee, for the manufacture of all kinds of bridge work.

The Minneapolis, Sault Ste. Marie & Atlantic has lately completed an iron riveted lattice draw-bridge of 290 ft. span across the St. Croix River, about 38 miles east of Minneapolis.

M. S. Carter & Co., of St. Louis, Mo., are building a bridge across the Suwanee River at Ellaville, Fla., for the Florida Railway & Navigation Co.

The Grand Trunk has lately completed a plate-girder bridge over the Ontonabee River, at Peterborough, on the Middle Division.

The Lassing Bridge Co. of Chicago, Ill., has completed an iron bridge of 178 ft. span over the Illinois & Michigan Canal for the Illinois Valley & Northern Railroad.

The County Commissioners will erect an iron bridge over the St. Joseph River at Berrien Springs, Mich.

The contract for erecting an iron bridge across the Gunpowder River, near Spark's station, Md., has been let to the Wrought Iron Bridge Co., of Canton, O., at \$4,472.

Emmett F. Cook, Jacksonville, Fla., can furnish information concerning two iron bridges to be built near Oxford, Ala. One is to be 125 ft. long and the other 140 ft. long.

The contract for erecting a bridge at Dublin, Ga., will soon be let.

Proposals are asked until May 10 for building the superstructure of a wrought-iron bridge, 69 ft. long, at Warren, Mass. Address Samuel N. Gleason, of the Board of Selectmen.

It is reported that the two bridges are to be constructed at Dunlap, Tenn., by the County Commissioners.

It is reported that a large bridge is to be erected at Warsaw, N. Y., by the New York, Lake Erie & Western.

It is now said that the Chesapeake & Ohio bridge over the Ohio, at Cincinnati, will be completed and track laid into the central station by Jan. 1, 1889. One span of 490 ft. will be swung by July 1. There are three river spans, one of 550 ft. and two of 490 ft. each, through trusses, double track, with wagon road and footway on each side. About 200 car loads of material for the superstructure have been delivered on the ground. The contractors are the Phoenix Bridge Co. for superstructure, Soysmith & Co. for the foundations, and Mason, Hoge & Co. for the masonry. The chief engineer is E. Randolph. There will be about a mile of elevated track in the approaches.

The annual report of the Central Pacific shows \$153,000 spent last year for repairs of bridges, an increase over the previous year of \$91,000. Of this, \$26,000 was spent on the American River bridge.

The Lake Erie & Western contemplates the substitution of iron for wood in nine spans at four different crossings of streams. The Keystone Bridge Company has the contract for the substitution of iron trusses in the place of eight Howe truss spans of 150 ft. each over the Sandusky, at Fremont, O.

The following bids for abutments for Harvard Bridge at Boston were opened by the Commissioners: Boynton Bros.,

Boston, Mass., \$13,256.65; William H. Ward, Lowell, Mass., \$15,900; Charles H. Edwards, Quincy, Mass., \$18,557; Shields, Carroll & Neelon, Toronto, \$19,659; Thomas A. Rowe, Newton, \$22,500; George S. Barnes, Boston, \$31,012. The contract was awarded to William H. Ward.

Iron and Steel.

Seaman, Sleeth & Black, proprietors of the Phoenix Roll Works, at Pittsburgh, are engaged in making four large rolls, each of which will weigh 32 tons, and will be 13 ft. long and 51½ in. in diameter. It will require about two weeks' time to finish each roll, and when done they will be shipped to the South Chicago Rolling Mill Co.

A. W. Thompson, who has heretofore been secretary of the Etna Iron Works, Limited, of P. L. Kimberley & Co., at New Castle, Pa., has assumed control of the rolling mill department of the plant.

Smith furnaces are being placed in the Iowa Rolling Mill, Burlington, Iowa.

Robert W. Hunt, formerly connected with the Troy Steel & Iron Co., has established the firm of Robert W. Hunt & Co. Bureau of Inspection, Tests and Consultation, with the general office in Chicago, and branch offices in Pittsburgh and New York. Mr. Hunt's associates are Messrs. John J. Cone, G. W. G. Ferris, Frank C. Osborn and James C. Hallsted. The specialty of the bureau will be the inspection of rails.

The converter at the Bessemer steel-works of the Colorado Coal & Iron Co., Pueblo, Col., commenced running at full capacity the week before last. The steel rail mill also started at its full capacity the same week.

The rolling mill at Lookout, Tenn., is engaged upon an order for angle plates for the Chattanooga, Rome & Columbus. This mill is employing 300 men, with an output of 30 tons of finished iron per day.

The Union Foundry & Machine Co., Limited, of Pittsburgh, has recently added to its works the manufacture of machine-molded gearing.

Lodge, Davis & Co., Cincinnati, O., have just purchased additional ground and will put up a building at once. When their increased facilities have been completed they will commence the manufacture of several new lines of machine tools.

Edward Roberts, for many years connected with the firm of P. L. Kimberley, Sharon, Pa., has accepted the management of the works of the Youngstown Rolling-Mill Co., at Youngstown, O.

Manufacturing and Business.

George E. Blaine, of the Blaine Car Manufacturing Co., of Dayton, O., has assumed the management of the new shops of the New York, Mahoning & Western at Findlay, O., where he will hereafter manufacture his specialties in addition to freight car building and the company's general repairing.

The Richmond Weather Strip Co., of Richmond, Ind., has supplied the New York, Lake Erie & Western, Chicago & Grand Trunk and Western Alabama roads with its weather strip and it is being experimented with on several other roads.

The Toledo Foundry & Machine Co. has contracted with the Pennsylvania for a second Victor excavator with a capacity of 8 yds. per minute. The firm has sold one of its pitless turn-tables to the Mobile & Ohio for the Mobile terminus, and has an order from Germany for one of Stocks' patent railroad velocipedes.

The Julien Electric Co., Limited, has been organized in London with a capital stock of £100,000, to purchase certain British patents for various applications of electricity and to carry on the business of manufacturing or dealing in engines, machinery, and other things which are manufactured or used in accordance with the inventions.

Charles A. Schieren & Co., of New York, have purchased the right and title of the Gabel Belting Co., of Chicago, and will continue the business under the name of the firm, Charles A. Schieren & Co., and under the direction and management of Emil Gabel, who will also have control of the American Leather Link Belt Co.

The Vulcan Iron Works, Chicago, Ill., report orders for their car pile drivers from the St. Paul, Minneapolis & Manitoba, and for their bridging machinery from the Powers Dredging Co., of Chicago, the United States Government and others.

The contract for the iron work for the elevated track, platforms and canopies of the Union Depot at Hartford, Conn., has been let to the Pencoyd Bridge Co. upon plans prepared by Theodore Cooper, of New York. It will require about 1,000 tons of iron to complete the contract. The depot is being built jointly by the city of Hartford and the New York, New Haven & Hartford, and New York & New England roads.

The Bass Foundry and Machine Works, Fort Wayne, Ind., are putting in new machinery to the value of \$22,000 in their car wheel department. The management report a decided improvement in business of late.

The Marion Steam Shovel Co., Marion, O., have delivered one of their Barnhardt steam shovels and wrecking cars to the Eureka & Eel River road.

The Roanoke Rolling Mill Co. has been organized, and capital subscribed to build at Roanoke, Va., a rolling mill for the manufacture of bar iron, axles, etc. It is expected that the mill will be in operation before the end of this year.

The Harris Corliss Engine Works, heretofore conducted under the name of Wm. A. Harris, has by act of the General Assembly of the state of Rhode Island been incorporated and is now styled William A. Harris Steam Engine Co. Mr. Harris established this business in 1864, is President and Treasurer of the new company, and the works will be conducted and managed in the same manner as when run in his own name.

The Rail Market.

Steel Rails.—The market continues dull and quotations unchanged, at \$31 to \$31.50 at Eastern mills.

Old Rails.—Prices nominal at about \$20.50 on cars Jersey City. Some inquiries, but little actual business.

Track Fastenings.—Prices unchanged. Angle plates, 1.90 @ 2 cents; spikes, 2.15 cents; bolts and nuts, 3 cents delivered.

The Cause of a Boiler Explosion.

The coroner's report on the locomotive boiler explosion which occurred on the New York & New England near Manchester, Conn., March 28, gives the following opinion of Mr. F. S. Allen, of the Hartford Steam Boiler Inspection & Insurance Company, who examined the exploded boiler:

The locomotive was built in March, 1872, by the Hinkley Locomotive Works. The shell of the boiler was made of ¾-in. boiler iron, and the fire-box was made of ¾-in. high grade steel. In the month of June, 1885, the boiler was stripped, all defective parts removed or repaired, thoroughly tested, and left the shops on the 23d of that month in what was supposed to be in good condition. On June 12, 1886, the boiler was inspected by the railroad company, and tested under water pressure to 175 lbs. The mud plugs were removed once a month and the boiler washed out, and at such times was inspected through the mud holes with the aid of a lighted candle placed inside. The pop-valve was set to blow

at 135 lbs. There were no faults of construction in the boiler.

The shell of the boiler was not affected by the explosion. The initial point of rupture was at the forward left hand corner of the crown sheet, the crown shearing along the edge of flange of flue sheet, drawing in the left hand side of the fire-box as it sprung down, entirely tearing it from its stay bolts from front to rear, and also tearing along the back end of the fire door where the rupture closed. The left hand plate of fire-box was blown across to the right hand side, doubling back about half of the crown up under the standing portion of the crown sheet. There was no weakness from rust or corrosion either in the plates or stay bolts. Near the centre of the left hand sheet were about half a dozen stay bolts, which were apparently broken before the explosion, but the explosion could not be attributed to that defect.

The primary cause of the explosion was the defective quality of the material used in the construction of the fire-box. It was not sufficiently ductile. When the engine in question was built, high grade steel of the quality used in the construction of the fire-box was regarded by experts as the best material that could be obtained for that purpose. Extended use, however, has demonstrated the fact that steel possessing so low a degree of ductility is unsuitable for boiler work for these reasons:

First, it may become fragile at a comparatively low temperature; second, it is liable to become dangerous from checking or cracking in the manner above described; that it is liable to give way from sudden shock or strain; and fourth, it is more sensitive to expansion and contraction, and will not show weakness by bagging or bending, as a softer metal would, but retains its original position and apparently its original strength until the moment of rupture. Other grades of metal have other defects. When this boiler was built it was well built, and of the best material, according to the judgment of persons competent to judge; it had stood the test of actual service without apparent deterioration; and the defects developed by the explosion were of a kind which could not have been discovered before by careful inspection.

The coroner finds that the explosion was accidental, and that the railroad company had exercised reasonable care and skill.

An Improved Torpedo.

The Bevington Signal Co., of Fostoria, O., has recently introduced a new pattern of torpedo signal, which is made oblong, and in the shape of a double wedge, so that a wheel approaching from either direction first strikes the thin edge, the tendency of the wheel to crowd the torpedo out of position being thus lessened. The strap is secured by a new style of fastening which is said to be much better than the ordinary fashion of soldering. This torpedo is in use on a number of prominent western roads.

An Audible Bridge Guard.

The New York, New Haven & Hartford has equipped a number of its guards at overhead bridges with bells to be automatically rung by every wheel of a passing train. The usual horizontal arm which holds the pendent wires or ropes at a level with the brakeman's forehead has fastened to it four bells or gongs which are rapped by a lever sufficiently strong to make a loud sound noticeable above the noise of the train. The lever is actuated by a perpendicular rod, which is in turn operated by a horizontal arm extending from the post to the rail.

Running Backwards.

The Jeffersonville, Madison & Indianapolis, which runs passenger trains backwards some distance to reach the station in Jeffersonville, Ind., has fitted some passenger cars with air whistles, so that the rear brakeman who has to act as pilot on a train running in that way, can sound an alarm to persons walking on the track as well as at street crossings when necessary.

Car Heating.

We are informed by an officer of the Atchison, Topeka & Santa Fe (which about a year ago was reported to have adopted the Emerson system of heating) that it is the intention of the company to "make exclusive use of an independent system invented by Messrs. Houston and Hackney, of that company."

A train on the Grand Rapids & Indiana has just been equipped with the McElroy system of steam heating.

Car Coupler Notes.

The manufacturers of the Janney coupler report a daily output of couplers for 65 cars, or about equivalent to 20,000 cars per annum. The couplers now being made are chiefly for the New York, Lake Erie & Western, the New York Central and the Pennsylvania and connecting lines.

Tire Shrinkage Gauge.

The adjustable tire shrinkage gauge made by Pedrick & Ayer, of Philadelphia, has been used on the Northern Pacific during the last six months, and the master mechanics of that road appear to think very highly of its merits. Mr. McNaughton writes:

"The boring of locomotive wheel tires to a uniform degree of shrinkage is an important operation, and the too common practice of guess work as to proper shrinkage allowance is dangerous, and often the source of broken tires and cracked spiders. To bore tires 0.060 less than the spider for 56-in. wheels prior to the introduction of your gauge was a very tedious operation indeed. The work can now be done with the same degree of accuracy that attends the use of the best micrometer gauge, with the further advantage of its more simple manipulation and that the points of contact may be subjected to any amount of wear and abuse without in the least affecting its accuracy."

Cascade Tunnel.

It is said that the headings of this tunnel met May 2, and that trains will be running through this month. The famous switchback over the summit will soon be only a matter of history.

Creosoting Works in Washington Territory.

It is said that creosoting works to the cost of \$150,000 are erecting at Seattle. The superintendent is E. C. Wheeler.

THE SCRAP HEAP.

Exhibition of Devices for Preventing Accidents.

An exhibition of devices for preventing accidents is proposed to be held in Berlin (Germany) during the year 1889. Although the project is still unfinished it has already reached the stage of having a programme. The exhibition will be divided into two chief classes. Protections of general interest and protections of interest to special branches of industry. The first will include protections on general machinery, steam boilers and motors, prevention of fires, protections against

poisons, gases, etc. In the second class are included the various groups of industries, such as metal, wood, textile, paper, leather, food materials and others, and also transportation by land and water.

The Burlington Strike.

May 5 is set as the date on which the Inter-state Commerce Commission will begin at Chicago the inquiry into the engineers strike on the Chicago, Burlington & Quincy. Chairman Cooley has been seriously ill.

Chicago dispatches of May 2 assert that the leaders have decided to declare the strike "off" at once.

Politics in Railroadings.

Romance and reality are thus pleasingly blended by the New York Sun: At the recent time convention held in this city, among other rules adopted was one that on the rear end of all trains two green flags should be carried, to be known as "markers." Since the convention these flags have been carried. A son of the Emerald Isle in employ of the New York Central, noticing these emblems of his native land flying from one of the cars, was heard to remark to his fellow laborers: "Shure and that's a moity injurious device of Mister Depew to catch the Irish vote, and it's bound to make him Prisdint if he lives long enoof."

Worse than the Eastern Blizzard.

During the terrible snow-storms which raged recently in Southern Russia, the great town of Odessa was for a whole week cut off from all railway connection with the outside world. At one station, Rasdeluaja, 3,000 travelers became weather bound, and were nearly starved to death, all communication with the station being cut off. At another, Birsula, where ten trains were detained, the stationmaster had to kill his five best milch cows to save the travelers from starvation.—*Railway News (London).*

Unflagging Zeal.

"He never flagged in his duty," the minister said, speaking of the rear brakeman, whose friends had asked him to conduct the services. "No, indeed," assented the other brakeman, "that's the way his old train come to be knocked into the middle of next eternity."—*Robert J. Burdette in Palfinder Guide.*

The Decapod Surpassed.

A Milwaukee man has invented a new method of applying power for the propulsion of cars. In applying it to railroad cars an attachment operated by cables extending the whole length of the train is placed on every axle. By means of a ratchet the power of the locomotive is transmitted directly to the axles, and when the throttle is opened the wheels of every car are set in motion simultaneously with the wheels of the locomotive. It is claimed that by the use of the new device a locomotive can draw a much larger load than by the present method. We should say so. Probably this will be called the centipede system.

Steamers for the Manitoba.

The first of the six steamers contracted for by the Globe Iron Ship Building Co. at Cleveland for the St. Paul, Minneapolis & Manitoba, is launched, and three others are under construction. It is expected that they will be launched at intervals of about six weeks, and that four vessels of the line will be ready for this season's traffic. The steamer just launched is called the Northern Light, and others are to be named the North Star and North Wind. Some of the dimensions of the Northern Light are as follows: 290 ft. keel, 312 ft. over all, 40 ft. beam and 24½ ft. hold. She has an estimated carrying capacity of 2,800 tons, and an estimated speed of 12 miles per hour. She will have triple expansion engines, cylinders 24, 38 and 61 in., with a 42-in. stroke, and two Scotch boilers, 14 x 12½ ft. Her wheel will measure 14 ft. in diameter, with a 17-ft. pitch. These vessels are to be of steel and iron, and designed exclusively for freight traffic, to ply between Superior City and Buffalo.

New Line to the West Indies.

The first steamer of the new line between New York and West Indies, The Royal Dutch West Indian Mail Service, left New York May 1. The line consists of four vessels of 1,250 and 1,500 tons, and the line will be under the supervision of the Hamburg American Packet Co.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Alabama, the Supreme Court, construing the Act of Congress of June, 1856, granting lands to railroads in that state, holds (1) that the act vested a legal title in the state and its appointee, subject to be divested on non-performance of a condition subsequent; (2) that the failure to perform this condition does not revert title in the United States, but the title remains in the grantee until divested by proper action, legislative or judicial, declaring a forfeiture; (3) that each of the railroad corporations designated by the state as the recipients of this bounty might sell and convey, before any work was done on the road, the lands embraced in a continuous length of 20 miles, or 120 sections, and (4) that this absolute right of sale does not extend beyond that limit. (5) On a sale of these lands, if located beyond the limits of the first continuous 20 miles of the road, no title would pass to the purchaser, and he could successfully defend, on that ground, a bill to enforce a vendor's lien on the land; but having taken possession under his purchase, and still holding it undisturbed, the onus is on him to show that the land was not within the 20-mile limit, and that therefore the railroad company had no authority to sell.¹

In the same state it is held that the statute giving a father, or, in certain cases, a mother, a right of action for personal injuries to a minor child, does not take away the minor's right of action, if the parent does not sue.²

In the same state the Supreme Court holds that the Alabama act of Feb. 28, 1887, for the protection of the traveling public against accidents resulting from color blindness or other defective vision on the part of railroad engineers, is constitutional, and if the provision which declares that the examinations shall be at the expense of the railroad corporations, or the provision which authorizes the state Board of Health to make alterations or additions in or to the rules and requirements prescribed by the statute, one or both, be unconstitutional, for any reason, this would not destroy the entire statute, nor defeat a criminal prosecution under it. Although the General Assembly of Alabama cannot regulate or prescribe the conditions of contracts made in another state, it may regulate the employment of persons here under contracts made elsewhere; and this is the extent of said statute of Feb. 28, 1887, in reference to the employment of railroad engineers who have not been examined as required.

In Ohio, one H. subscribed for a number of shares of the capital stock of a railroad company, the subscription being made payable on the order of the directors, in installments,

and to be paid when the road was completed. The company being unable, from lack of means, to complete the construction of its proposed line of road, duly executed its deed purporting to sell and transfer its roadbed, right of way, subscriptions, and other property to another railroad company, which latter company completed the construction of the road, and was afterwards consolidated with another railroad company. The Supreme Court holds that the statutes of Ohio did not confer authority to sell and transfer the stock subscription of H.; and no ownership in the subscription passed to the company grantee, by virtue of the deed; and that the subscription of H. was conditional and the company grantee did not, by performing the condition precedent named in the subscription fix and make absolute the liability of the subscriber.³

In Massachusetts the Supreme Judicial Court holds that neither the equitable right of a railroad company, nor that of its predecessor, to land outside of a located and established railroad, will prevent the acquisition of title by the long continued adverse possession of another.⁴

Injuries to Passengers, Employees and Strangers.

In Kansas, the Supreme Court holds that a conductor upon a branch road, or connecting road of the same railroad company, in collecting fares, taking up tickets, and giving information to the passengers on his own train, represents the company as to his own route, but does not represent the company in giving information as to the running and operation of the trains upon the main line with which he has no employment.⁵

In Wisconsin, it was shown that a passenger who had been injured in a collision, while sick in bed, and suffering from such serious injuries to his head and face as to affect his sight and render him dizzy, signed a sealed release of his claims against defendant for his loss of property and personal injuries sustained. The Supreme Court holds that this did not prevent the plaintiff from showing that he was ignorant of the fact that he was releasing his claim for personal injuries, although no actual fraud in procuring the release was proved.⁶

In Massachusetts the Supreme Judicial Court rules that a passenger by a railroad train, who has reached his destination, alighted from the train, and taken a position upon the side walk of the highway, has ceased to be a passenger. In this case, a passenger having alighted at her destination, as soon as the train moved on, without waiting for the street gates to be raised, and without looking to see whether a train was approaching, undertook to pass along a street leading over the double tracks of the railroad, and was struck by a train coming into the station at the rate of five or seven miles an hour, with its brakes on and about to make a stop. The Court holds that she was negligent and cannot recover damages.⁷

In Kansas the Supreme Court holds that where a conductor in ejecting a person from a railroad train uses insulting or abusive language in ejecting him, such party may recover damages therefor on account of the injury to his feelings; but he cannot, in an action for damages for his expulsion, also recover damages because the words used by the conductor tended to bring him into ignominy or disgrace.⁸

In the same state it is held that where a person is removed from a railroad train with the assistance of some of the passengers, and willful, wanton and malicious force is used in the ejection by the passengers assisting, the railroad company may be liable therefor, although no express directions were given by the conductor or trainmen to the passengers, as their employment to assist may be inferred. Otherwise, however, if the passengers are mere interlopers and the conductor and trainmen have no opportunity to interfere with their actions.⁹

In Kansas the Supreme Court rules that a trespasser may be ejected from a train after it has stopped at a place other than a depot or station, provided care is taken not to expose his person to serious injury or danger; but, in such an ejection, the railroad company is not required to have consideration for the mere convenience of the wrong-doer.¹⁰

- ¹ Mathis v. Tenn. & C. R. Co., 3 South. Rep., 793.
- ² Propst v. So. Pac. R. Co., 3 South. Rep., 765.
- ³ Toledo, C. & St. L. R. Co. v. Hindsdale, 13 West Rep., 449.
- ⁴ Littlefield v. B. & A. R. Co., 5 New Eng. Rep., 833.
- ⁵ A. T. & S. F. R. Co. v. Sants, 17 Pac. Rep., 54.
- ⁶ Lusted v. C. & N. W. R. Co., 36 N. W. Rep., 557.
- ⁷ Allerton v. B. & M. R. Co., 5 N. Eng. Rep., 826.
- ⁸ South Kan. R. Co. v. Hindsdale, 16 Pac. Rep., 937.
- ⁹ A. T. & S. F. R. Co. v. Sants, 17 Pac. Rep., 54.
- ¹⁰ A. T. & S. F. R. Co. v. Sants, 17 Pac. Rep., 54.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston, Concord & Montreal, \$2.50 per share, payable May 1, to preferred stockholders of record April 16.
Boston & Maine, annual, \$5 per share, payable May 15, to stockholders of record April 26.
Cincinnati, Sandusky & Cleveland, semi-annual, 3 per cent. on preferred stock, payable May 1.
New York, Providence & Boston, quarterly, 2½ per cent., payable May 10.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The Ohio Institute of Mining Engineers will hold its summer meeting at Logan, O., commencing July 11.
The International Association of Car Accountants will hold its annual meeting in Montreal, Can., June 19.
The American Institute of Mining Engineers will hold its fifty-first meeting at Birmingham, Ala., commencing May 15.
The American Society of Mechanical Engineers will hold its seventeenth meeting at the Maxwell House, Nashville, Tenn., May 8 to 11.
The American Train Dispatchers' Association will hold its fifth annual meeting at Louisville, Ky., June 12.

The National Association of General Passenger and Ticket Agents will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The National Association of General Baggage Agents will hold its next meeting in New York City July 18.

The Master Car-Builders' Association, annual convention, Alexandria Bay, N. Y., commencing June 12.

The American Railway Master Mechanics' Association, next annual convention, Thousand Islands, N. Y., June 19.

The New England Railroad Club meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The New York Railroad Club meets at its rooms, 118 Liberty street, New York City, on the third Thursday of each month.

The Western Railway Club meets in Chicago the third Wednesday in each month.

The Central Railway Club meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The American Society of Civil Engineers holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, N. Y.

The Boston Society of Civil Engineers holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The Western Society of Engineers holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The Engineers' Club of St. Louis meets the first and third Wednesday of each month till June.

The Engineers' Society of Western Pennsylvania meets in Pittsburgh the third Tuesday of each month.

Burlington, Cedar Rapids & Northern, annual meeting, Cedar Rapids, Ia., May 22.

Cheshire, annual meeting, Keene, N. H., May 9.

Chicago, Burlington & Quincy, annual meeting, Chicago, Ill., May 16.

Chicago, Milwaukee & St. Paul, annual meeting, Milwaukee, Wis., June 2.

Chicago & Northwestern, annual meeting, at the office in Chicago, Ill., June 7.

Connecticut River, special meeting, at the office in Springfield, Mass., May 4.

Delaware & Hudson Canal Co., annual meeting, 21 Cortlandt street, New York, May 8.

Denver & Rio Grande, annual meeting, Denver, Col., May 22.

Harrisburg & New England, annual meeting, Philadelphia, Pa., May 7.

Lehigh & Eastern, special meeting, Philadelphia, Pa., May 9.

Louisville, New Orleans & Texas, special meeting, Memphis, Tenn., May 7.

Middletown, Unionville & Water Gap, annual meeting, 15 Cortlandt street, New York City, May 28.

Missouri, Kansas & Texas, annual meeting, Parsons, Kan., May 16.

New York & Harlem, annual meeting, New York City, May 15.

Omaha & St. Louis, annual meeting, Stanberry, Mass., May 15.

Pittsburgh, Fort Wayne & Chicago, annual meeting, Pittsburgh, Pa., May 16; special meeting, June 13.

Pittsburgh & Western, annual meeting, Allegheny City, Pa., May 7.

Pueblo & Arkansas Valley, annual meeting, Pueblo, Col., May 12.

Richmond & Danville, special meeting, Richmond, Va., May 21.

Vicksburg & Meridian, annual meeting, 40 Wall street, New York, May 7.

Ohio Institute of Mining Engineers.

The summer meeting of the Ohio Institute of Mining Engineers will be held at Logan, Ohio, on July 11, 12 and 13. The prospects are that the meeting will be of unusual interest, and it is requested that all members be present. R. S. Wetzell, Kittanning, Ohio, is secretary of the Institute.

Central Railway Club.

At the regular meeting of the Central Railway Club, held at Tift House, Buffalo, on the fourth Wednesday in March, interesting and instructive papers were read on the following subjects: "Defective Truck Timber," "Draft Springs" and "Extended Fronts." The subjects were thoroughly discussed and placed on the records of the club. On account of so much diversity of opinion as to the meaning of many of the rules of interchange, especially among Joint Inspectors and others directly connected with the interchange of cars, a committee was appointed to draw up a series of interpretations of such rules as are indefinitely understood. This committee is composed of Robt. Potts, Michigan Central, St. Thomas, Ont., Chairman, and Messrs. Sills, Petrie, Schwab and Garvey, Joint Inspectors of the most important points between the East and West. They are to present their report at the next regular meeting of the club, May 23.

The club will hold two sessions, if necessary—10 a. m. and 3 p. m.—to discuss the report and decide on a series of interpreted rules, to be referred to the Rules of Interchange Revision Committee of the M. C. B. Association, with the recommendation of the Central Railway Club that they be presented to the Association at the annual convention in June for adoption. As much interest is being taken on this question, a large attendance is anticipated at the club meeting May 23.

New England Railroad Club.

The regular monthly meeting of the club will be held on Wednesday, May 9, 1888, at 7:30 p. m., at the rooms of the club, Boston & Albany passenger station, Boston, Mass. The subject for discussion will be "Heating Passenger Cars by Steam."

PERSONAL.

—The Hon. Frederick E. Woodbridge, a prominent citizen of Vermont, and for several years the Vice-President and General Manager of the Rutland & Washington road, now part of the Delaware & Hudson Canal Co.'s system, died at Vergennes, Vt., April 22.

—A testimonial has recently been presented to Mr. R. H. Soule, the General Manager of the New York, Lake Erie & Western, by the employees who have served with and under him. The testimonial consisted of a morocco-bound volume containing over 4,000 autographs of employees in every occupation, from the section hand up to the general superintendent, and a handsome Jurgensen watch, chain and pendant seal, with a suitable inscription, and a cut-glass dessert set for Mrs. Soule. Subscriptions were limited to a maximum of 25 cents, and over \$500 was contributed.

One of the subscribers writes us: "We believe that you know Mr. Soule personally, and that it will be no hard matter for you to understand the enthusiasm with which this scheme was carried through. It was a prompt, spontaneous expression of heartfelt good will for a splendid gentleman. You will be able, from our brief outline of the scheme given here, to let the public know just what the great mass of Erie men think of Mr. Soule."

ELECTIONS AND APPOINTMENTS.

Augusta & Chattanooga.—The President of this company is Gen. C. A. Evans and the Treasurer Capt. W. B. Young, both of Augusta, Ga.

Austin & Northwestern.—The following directors and officers were elected last week: Directors, W. B. Isham and H. A. V. Post, of New York; John Collett, of Indiana; Hon. W. H. Westfall, of Burnet, Tex.; Hon. John Hancock, A. F. Wooldridge and C. L. Leitnaker, of Austin. Officers, President, John Collett, of Indiana; Vice-President, W. H. West-

fall; Treasurer, W. B. Isham; Secretary, J. H. Rhombert, Jr.

The company has been reorganized with the following list of officers: John Collett, of Indiana, President; W. H. Westfall, of Burnett, Vice-President; W. B. Isham, of New York, Treasurer, and J. H. Rhombert, Jr., of Austin, Secretary.

Baltimore & Ohio.—James Calhoun has been appointed Assistant General Freight Agent of the Philadelphia Division, with headquarters in Philadelphia, and will have charge of the freight traffic of that division.

Baltimore & Ohio & Chicago.—The following directors were elected at the annual meeting of this road, which is the Chicago Division of the Baltimore & Ohio: J. K. Cowan, James Walsh, Minor T. Ames, W. W. Peabody was elected President, vice Orland Smith resigned.

Boston & Maine.—H. Bissell has been appointed Chief Engineer, with office at Boston, Mass.

Chattanooga & Lookout Mountain.—The following are the officers of this company: E. Watkins, President; H. Whiteside, Vice-President; Gordon Lee, Secretary; W. O. Peoples, Treasurer. The general office is in Chattanooga, Tenn.

Chicago & Grand Trunk.—The following directors were elected at the annual meeting: Joseph Hickson, L. J. Seargeant, W. C. Beardsley, F. A. Howe, H. Howard, E. W. Meddaugh, D. F. Skinner. The following officers were elected: Joseph Hickson, President; L. J. Seargeant, Vice-President; J. H. Muir, Treasurer; and C. Percy, Secretary.

Chicago & Gulf Air Line.—The following are the incorporators of this Tennessee company: Hiram D. Faulkner, Amasa Mason, Howard P. Simmons, Silas W. Cochran and John B. B. Fisker.

Columbus Southern.—The following are the officers of this company: President, T. J. Pearce; Treasurer, C. B. Grimes; General Manager, G. G. Jordan, Columbus, Ga.; Chief Engineer, W. S. Greene, Rome, Ga.

Duluth, South Shore & Atlantic.—C. E. Lytle has been appointed trainmaster and chief train dispatcher of the Mackinac and Houghton divisions, vice S. B. Floeter, resigned.

Durango.—The following are the incorporators of this company: John A. Porter, George F. Peabody, Henry Amy, S. E. Herr, Ernest J. H. Amy, Edward Lambert, Jr., and J. C. Sanford.

East Tennessee & Jacksonville.—John C. Rutherford, A. O. Bacon and Winter Wimberly are the incorporators of this new Georgia road.

East Tennessee, Virginia & Georgia.—Cary A. Wilson has been appointed Chief Engineer, with office in New York.

East & West Alabama.—A. G. West, of Cedartown, Ga., has been chosen Vice-President.

Helena, Tupelo & Decatur.—The following officers of this newly incorporated company have been elected: J. L. Finley, President; Harvey C. Medford, Secretary; C. W. Troy, Treasurer.

Kansas City, Fort Scott & Memphis.—The following have been elected directors of the consolidated company: Sidney Bartlett, Abbott Lawrence, H. H. Hunnewell, Charles Merriam, Francis Bartlett, Boston, Mass.; Nathaniel Thayer, Lancaster, Mass.; T. Jefferson Coolidge, Manchester, Mass.; B. P. Choney, Wellesley, Mass.; John A. Burnham, Boston; George H. Nettleton, Kansas City, Mo.; Charles W. Blair, Leavenworth, Kan.; O. E. Learnard, Lawrence, Kan.; B. P. McDonald, Ft. Scott, Kan.

Knox & South Bend.—The first board of directors of this Indiana company is as follows: C. H. Smith, Edwin Fletcher, Byron N. Haslett, Lewis H. Miller and William B. Courtright.

Lake Shore & Michigan Southern.—W. K. Vanderbilt, Samuel F. Barger, J. H. Wade and Charles M. Reed were re-elected directors at the annual meeting this week.

Midland (Indiana).—Henry Crawford has been appointed General Manager, with office in Anderson, Ind.

Missouri Pacific.—Charles Weller has been appointed master mechanic at Atchison, Neb.

Nashville & Knoxville.—The following directors were re-elected at the annual meeting held in Lebanon, Tenn., last week: A. J. Crawford, of Terre Haute; A. E. Sanderford, W. M. Patterson and L. S. Hoyt, of New Castle, Pa., and J. M. Hamilton, of Nashville, Tenn.

New York, Mahoning & Western.—George E. Blaine has been appointed Superintendent of car shops at Findlay, Ohio.

Old Colony.—F. M. Twombly, Division Master Mechanic, has been assigned to duty on the Providence division, with office at Roxbury Shops. Samuel P. Willis, Traveling Engineer, has been appointed Acting Division Master Mechanic of the Central and Cape Cod divisions, with office at South Boston, vice F. M. Twombly, transferred.

Olympia, Gray's Harbor & Barker's Bay.—This recently incorporated company has elected the following officers: President, N. H. Owings; Secretary, Jas. R. Hayden; Attorney, John F. Gowey. The general office is in Olympia, Wash. Ter.

Redondo Beach.—The directors of this new California company are as follows: George O. Manchester, C. W. Smith, D. McCool, Herman Silver and W. W. Ross.

St. Joseph & Grand Island.—John M. Ragan has been appointed General Attorney, to succeed John Doniphan, with office at St. Joseph, Mo.

St. Louis, Arkansas & Texas.—The following directors were elected at the annual meeting held in St. Louis this week: William M. Senter, S. A. Bemis, S. W. Fordyce, R. C. Kerens, J. W. Philis, H. G. Allis, W. P. Homan, H. D. Wilkins and J. C. Reiff.

San Gabriel Valley Rapid Transit.—H. A. Unruh, Los Angeles, Cal., is President of this company.

San Pedro, Los Angeles & Utah.—Lester F. Scott, Los Angeles, Cal., is now Secretary of this company.

Southern Kansas (of Texas).—The following directors and officers were elected at the annual meeting in Fort Worth, Tex.: W. B. Strong, A. W. Nickerson, Allen Spears and J. T. Burk, of Boston; Webster Snyder, R. S. Willis, George Sealy, W. H. Masters and T. W. Jackson, of Galveston. Officers: W. B. Strong, President; C. W. Smith, Topeka, First Vice-President; A. A. Robinson, Topeka, Second Vice-President and Chief Engineer; E. Arder, of Topeka, Secretary and Treasurer.

Tacoma, Ellensburg & Conconully Railway & Navigation Co.—The following officers have been elected: Linus E.

Post, President; Thomas L. Nixon, Vice-President and Chief Engineer; Theodore L. Stiles, Secretary. The general office is in Tacoma, W. T.

Texas & Pacific.—J. C. Brown has been elected President and George J. Gould Vice-President.

Union Pacific.—J. G. Harris has been appointed Treasurer and A. Miller Secretary, with office in Boston, Mass., to succeed Henry McFarland, resigned.

West Virginia Central & Pittsburgh.—The old board of directors and officers were re-elected at the annual meeting held last week.

OLD AND NEW ROADS.

Ash Grove, Aurora & Eureka.—Meetings are being held in towns along the line of this road, which is projected from Ashland, Ga., on the Kansas City, Fort Scott & Gulf, southerly through Lawrenceburg to Aurora, a distance of about 30 miles. It is also proposed to ultimately extend it to Eureka Springs, Ark., via Cassville, Mo.

Atchison & Nebraska.—The Supreme Court of Nebraska has decided that this company forfeited its charter in leasing its road to the Chicago, Burlington & Quincy, and has declared the lease void. An appeal will be taken to the Supreme Court of the United States. The road has, however, been leased to the Chicago, Burlington & Quincy for 99 years.

Augusta & Chattanooga.—This company, whose line extends from Augusta, via Gainesville, Ga., to Chattanooga, Tenn., has its surveys nearly completed, and 20 miles of the road is already graded. Further contracts are to be let at once. The officers are given in another column.

Austin & Northwestern.—The extension of the road from Burnett, the present terminus, to Marble Falls and Llano County, Tex., will be commenced, it is stated, immediately.

Barre.—This company was organized during the winter to construct a road from Barre, Vt., to the quarries. The Granite road, supposed to be in the interest of the Central Vermont, has also organized to build over the same route, and both companies have claimed a certain piece of ground near Barre, but on the night of April 27 this company succeeded in laying four tracks across the disputed ground.

Bellingham Bay Railway & Navigation Co.—Contracts will probably be let soon for constructing the road from Seattle toward Hope, W. T., and it is expected to have 22 miles completed by next fall. The right of way has been partially secured. The maximum grade is 90 ft. per mile, and a 1,750 ft. bridge with draw span will be required. The company proposes to construct a road from Seattle to Whatcom, 95 miles, thence northeast toward Hope, 18 miles, and northwest toward New Westminster, B. C., to the International boundary, 20 miles. Eugene Canfield, Seattle, is President.

Bishopville.—An extension is being built from Crosswells to Scarborough, S. C., 7½ miles, of which four miles, to Shaws, have been completed.

Canadian Pacific.—It is stated that work will soon begin on an extension to connect with the Rome, Watertown & Ogdensburg at Massena Springs, N. Y., which was surveyed several months ago.

Chicago & Gulf Air Line.—The company has been chartered in Tennessee to construct the road from the connection with the proposed Gulf & Ship Island, near the Tennessee state line at Middletown, thence northerly through the counties of Hardeman, Menairy, Madison, Gibson, Carroll and Weakly, to a connection with the Kaskaskia, St. Elmo & Southern, at a point on the boundary line of Kentucky and Tennessee, between Fulton and the Tennessee River.

Chicago, Kalamazoo & Saginaw.—A preliminary survey has been made from Hastings, northeast to St. Johns, Mich., on the Detroit, Grand Haven & Milwaukee, a distance of 46 miles. No definite arrangement has been made, however, for the construction of the road. F. A. Cobb, of Kalamazoo, is the President.

Chicago & Northwestern.—The company has under construction branches from Ishpeming to Michigamme and Republic, Mich., about 33 miles, and also from Lake Geneva, six miles to Williams Bay, Wis.

Cincinnati & Dayton.—A survey is being made from Middletown to a connection with the Cincinnati, Hamilton & Dayton at Poast Town, Ohio, a distance of about four miles. It has not been decided when the contracts will be let.

Cincinnati & Green River.—Surveys will soon be commenced for an extension from Yosemite, Ky., the present terminus, through Dunnville, Casey County, about 25 miles, and it is thought that construction will be commenced by July. George B. Harper, Yosemite, Ky., is Chief Engineer.

Cleveland, St. Louis & Kansas City.—The surveys from East St. Louis, to Alton, Ill., have been commenced.

Covington & Macon.—Surveys have been made from Monticello, east about 30 miles to Griffin, Ga., and also from Macon south to the Florida line.

Duluth & Iron Range.—Tracklaying was commenced last week on the extension from Tower 21 miles to Chandler mine, St. Louis Co., Minn. This extension will cost \$25,000 a mile, ready for rolling stock.

Durango.—Incorporated in Colorado to build a road from Durango, on the Denver & Rio Grande, northeasterly to Rico, Dolores County. The capital stock is \$1,000,000, and the general office will be in Durango.

East Portland, Albina & Vancouver.—The company has been granted the right of way through East Portland and Albina, Ore., for its road, which is to be built north from the former place to a point on the Columbia River opposite Vancouver. It is intended as a suburban passenger line, and work is to commence within 60 days.

East Tennessee & Jacksonville.—Incorporated in Georgia to build a road from a point on the East Tennessee, Virginia & Georgia to a point on the boundary line between Florida & Georgia.

Ellensburg, Big Bend & Salmon River.—Surveys are in progress for this road, which is to extend from Ellensburg, W. T., easterly about 30 miles to the Columbia River.

Eutawville.—An extension has been surveyed from Vances to Summerton, S. C., and preliminary surveys have been continued to Sumter. The contract for the bridge and trestle across the Santee River and swamp at Waco was let some time ago.

Fremont, Elkhorn & Missouri Valley.—Work is progressing on extensions from Geneva southwest to Superior, Neb., near the state line, 47 miles, and also from Creighton northwesterly to Verdergris, about 18 miles. The Wyoming Central Division is also being extended from Glen Rock, the present terminus, west about 25 miles to Fort Caspar, Wyo., near the Rattlesnake Hills. The contracts for grading have been let to McDonald & Penfield, and Dolly & Haines, of Fremont, Neb. The bridging is being done by N. Disparois, of Sioux City, Iowa.

Georgia Southern & Florida.—Tracklaying has been completed from Macon south 40 miles toward Valdosta, Ga., to which point the ties have been distributed.

Hartford & Connecticut Western.—The company is endeavoring to have the Massachusetts Legislature authorize the extension from Tariffville, Conn., north to Springfield, Mass., 17 miles, which has already been surveyed.

Housatonic.—The dock at Wilson's Point, Conn., is being extended 300 ft. and widened to 60 ft., and a transfer bridge is being put in so that freight cars can be transferred on floats to New York city.

Houston & Texas Central.—The assent of Mrs. Hettie Green to the amended plan of reorganization has been obtained, and the securities held by her (\$250,000 of the first mortgage bonds and about \$1,000,000 of the third or general mortgage bonds) have been deposited with the Central Trust Co., of New York. There is, however, still opposition to the plan, by what is known as the Mornn party, who represent about \$2,000,000 of the first mortgage bonds. These parties are not in harmony with the committee and propose to contest the reorganization scheme.

Ignace, Sault Ste. Marie & Northern.—A survey is being made for this road which is to extend from St. Ignace, Mich., nearly due north about 25 miles, to a connection with the Minneapolis, Sault Ste. Marie & Atlantic. George Cox, St. Ignace, is Chief Engineer.

Illwaco & Shoal Water Bay.—The construction of the first four miles north from Illwaco, Wash. Ter., will soon be commenced. The company rejected the bids of the contractors and will have the work done under its own supervision. A large wharf and warehouse will be built at Baker's Bay, near Illwaco, and it is thought that the road will be completed to Oysterville, near Shoal Water Bay, this year. Hawgood & Habersham, Portland, Ore., are the engineers.

International & Great Northern.—Default has been made in payment of the coupons due May 1 of the first mortgage 6 per cent. bonds of 1919. The Missouri, Kansas & Texas Committee, which is opposing the present administration of the roads, has arranged with J. Kennedy Tod & Co., Adrian Iselin & Co. and Roosevelt & Sons for the purchase of the New York coupons, and these firms advise holders to sell their coupons to them instead of the Mercantile Trust Co., which purchases the coupons for account of the Missouri Pacific as lessee of the Missouri, Kansas & Texas.

Kansas, Chicago & Southwestern.—Mr. Joseph Jackson, of Maryville, Mo., desires us to state that this so-called organization, of which he was chosen President last fall, has no real existence and that there is no prospect of a road being built.

Kansas City, Fort Scott & Memphis.—The Kansas City, Fort Scott & Gulf with its various branches has become consolidated under the name of the Kansas City, Fort Scott & Springfield, and that company has now become consolidated with the Kansas City, Springfield & Memphis under the name of Kansas City, Fort Scott & Memphis Railroad Co., which thereby becomes the owner of all the lines of railroad heretofore controlled by these companies on and after April 26, 1888.

Knox & South Bend.—Incorporated in Indiana to build a road from Knox, Starke County, northeasterly to South Bend, St. Joseph County, a distance of about 33 miles. The capital stock is \$1,000,000.

Lake Erie & Western.—The extension from Bloomington to Peoria, Ill., was completed last week. The highest point on this extension is about seven miles east of Peoria, where there is a cutting 900 ft. long and in one place 64 ft. deep. It required about 115,000 cu. yds. of excavation, the greater part of which was hard pan. This is said to be the largest cutting in the state of Illinois.

Lawrence, Emporia & Southwestern.—It is stated that the road will soon be extended to Emporia and southwest. The road is at present in operation between Lawrence and Carbondale.

Louisville & Nashville.—The Cumberland Valley Branch has been completed from the present terminus to Pineville, Ky. The contract has not yet been let for the extension to Cumberland Gap, 15 miles.

Maryland Central.—The Reorganization Committee has perfected a plan for the reorganization of the company, which provides for the issue of a new \$850,000 mortgage, dated Nov. 1, 1888, bearing interest at the rate of 4 per cent. for the first ten years and 5 per cent. for the succeeding ten years. The \$600,000 first mortgage bonds and \$175,000 past-due interest of Baltimore & Delta road will be exchanged for new bonds, dollar for dollar, and \$25,000 of new bonds will be given for pay-roll loans, leaving \$50,000 in the treasury. The \$400,000 (principal \$300,000 and accrued interest \$100,000) Maryland Central second mortgage bonds will be surrendered and the holders will become the stockholders of the new company. The capital stock of the new company will be \$400,000 and funded debt \$850,000. The present stock of the Maryland Central will be wiped out, and the floating debt will be liquidated at 50 cents on the dollar. The old funded debt consists of \$600,000 first mortgage 6 per cent. bonds and \$300,000 second mortgage 6 per cent. bonds. The road extends from Baltimore, Md., to Delta, Pa., 44 miles, and has been in the hands of a receiver since the latter part of October, 1884.

Memphis & Little Rock.—The United States Court at Little Rock, Ark., has rendered a decision in the case of Russell Sage vs. this company, ordering the distribution of \$196,951 at present held by the clerk of the railroad. Of this amount Russell Sage will receive \$144,199 and P. K. Dow and others, the remainder.

Midland (Indiana).—The road is being extended from Ladoga easterly to Brown's Valley, Ind., on the Terre Haute & Indianapolis. The contracts for an extension to Rockville, in Park County, will be let soon. E. B. Cottingham, Nobleville, Ind., is the Chief Engineer.

Missouri Pacific.—It is stated that surveys will soon be made for extensions southwest from Bagnell, Mo., on the Osage River, to Carthage, and that branches from this line will be run to Springfield and Nevada, Mo.

Mobile & Ohio.—It is stated that the company will charter three steamers for the cotton traffic to Liverpool next season. This is independent of the Mobile & Liverpool Steamship Line already established.

Napanea, Tamworth & Quebec.—A survey will be made in about a month for an extension from Tamworth, the northern terminus, about twenty miles northwesterly to Tweed, Ont., on the Canadian Pacific. It is thought that an extension will also soon be located to Kingston, Ont.

Nashville, Florence & Sheffield.—It is expected that track on this branch of the Louisville & Nashville will be completed to Florence, Ala., by July 1. The West Point Branch is being extended from Iron City to Ironton, Tenn., about 12 miles.

Nashville & Knoxville.—The stockholders have authorized an issue of \$2,000,000 first mortgage bonds, to be issued as the road is completed. Tracklaying is progressing at the rate of about half a mile a day.

New Roads.—It is stated that the Queen Copper Mining Co. will build a road from its mines at Bisbee, A. T., via Tombstones to a connection at Fairbanks with the New Mexico & Arizona, a distance of about 35 miles.

Contracts have, it is stated, been let for the construction of a road from Gardner, Ill., north to Sandwich, on the Chicago, Burlington & Quincy, about 40 miles.

New York, Chicago & St. Louis.—The stockholders have authorized the extension from Stuartsville to Findlay, O., six miles.

Ohio Southern.—A meeting of the stockholders will be held at Springfield, Ohio, May 21, for the purpose of voting upon a proposition to increase the capital stock to \$5,500,000 and to provide for borrowing money to locate, construct, and equip the line and for the funding of the floating and other debt. The management recommend that provision be made for funding the car trusts, amounting to \$300,334, on long time, and that the terminal facilities in Springfield be increased.

Oregon Railway & Navigation Co.—Surveys are being made by two companies of engineers from a point about 60 miles east of Palouse Junction to Hangman's Creek and thence to Spokane Falls, Wash. Ter., and then to the Cour d'Alene mines, Idaho.

Oregon & Washington Territory.—Tracklaying has been completed from Wallula to Centerville, about 25 miles.

Philadelphia & Reading.—It is stated that the company contemplates in connection with its proposed elevated road in Philadelphia, the construction of a branch through Willow street to the Delaware River, to connect with the ferry to the Philadelphia & Atlantic City road.

Redondo Beach.—Incorporated in California to build a road to Redondo Beach from Inglewood, Cal., on the California Central, of which it will be a branch. The capital stock is \$275,000.

Rome & Decatur.—It is expected that the road will be completed to Atalla, Ala., about July 1, and it is stated that it may be extended to Decatur this year.

St. Louis & Central Illinois.—About seven miles of the extension from Alton south to Newbern, Ill., has been completed, and it is expected that the remaining six miles of the extension will be completed by July 1. A survey is being made for an extension from Bates, northeast to Springfield, which, it is thought, will be completed by Sept. 1. There were about three miles of solid rock-work above Alton that cost about \$25,000 a mile.

St. Paul, Alexandria, Jennings, Lake Arthur & Gulf.—The preliminary surveys for the road are now about half completed. That part between the Gulf and Alexandria is almost a level grade and but one bridge (30 ft. in length) will be required.

San Pablo & Tulare.—Tracklaying has been completed south from Tracy, where it leaves the main line of the Southern Pacific, to within 54 miles of Fresno, Cal., and the grading has been completed several miles beyond the end of the track.

San Pedro, Los Angeles & Utah.—The right of way has been secured and the surveys completed for the first 50 miles of the road from San Pedro Bay north through Los Angeles and Pasadena to Altadena, Cal. The steel rails (60 lb.) for this part of the road have been contracted for. The American Finance Co., of New York, is marketing an issue of \$1,000,000 first mortgage bonds of the first 50 miles of the road. The company also proposes to extend its line north to Keeler, Cal., the southern terminus of the Carson & Colorado. C. W. Scott, Los Angeles, Cal., is General Manager.

Southern Pacific.—A grading force has been put at work on an extension from Anaheim via Orange to Tustin, Cal.

Suffolk & Carolina.—The road has been extended from Ryland southwest to Montrose Landing, S. C., about four miles, which completes the road from Suffolk, Va., to the Chowan River, 39 miles. Branches have been surveyed from Rocky Hook and Edenton, 16 miles, and to Winton, Hertford Co., N. C., 14 miles.

Tennessee & Coosa.—The location for the extension from Gadsden northeast to Huntsville, about 76 miles, was completed last week to a connection with the Nashville, Chattanooga & St. Louis, in Huntsville.

Texas & Pacific.—The new securities of the company will be delivered as rapidly as possible after May 7. And a speedy application will be made for the discharge of the Receiver. J. C. Brown, the Receiver, has been made president and George Gould vice-president. In the last two years about \$6,000,000 has been put into the property out of the net earnings and the proceeds of an assessment on the stock. Nearly 51,000 tons of steel rails, 2,000,000 ties, 1,100 cars and 27 locomotives have been purchased. The fixed charges of the road have been reduced from \$2,100 per mile to \$1,250.

A short branch has been built from Strawn, Tex., about four miles, to reach coal mines.

Toledo, Saginaw & Muskegon.—The contract for tracklaying from Durand to East Saginaw, Mich., has been let to — Wiswell, of Chicago.

Tombigbee.—It is stated that construction work will commence in a month or two on this road, which is projected from Columbus, Miss., northeasterly to Decatur, Ala., about 130 miles.

Waco & Brazos Valley.—The preliminary surveys for this road have been completed, and the location will soon be commenced. Construction will be begun as soon as the right of way has been secured. The road is projected to extend from Waco southerly to Cameron, Tex., on the Gulf, Colorado & Santa Fe, a distance of 53½ miles. Stephen Turner, Waco, Tex., is Chief Engineer.

Waukena, Tulare & Mammoth Forest.—The contract for constructing this road has been let to J. H. Carlisle, and work will probably soon be commenced.

White & Black River.—The survey for this extension of the Batesville & Brinkley has been completed from Jacksonport, the present terminus, north through Powhatan to Pocahontas, Ark., and it is stated that construction will be commenced shortly. W. J. Thompson, Little Rock, Ark., is General Manager.

Wilkesbarre & Western.—It is expected that the extension from Millville, 23 miles to Shickshinny, Pa., which has already been surveyed, will be built this summer.

TRAFFIC AND EARNINGS.

Railroad Earnings.

The following is a comparative statement of the earnings and expenses of the Pennsylvania for March and the quarter to March 31:

Month of March:	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$4,526,561	\$4,410,433	I. \$116,128
Oper. expenses.....	3,035,948	2,974,492	I. 61,456
Net earnings.....	\$1,490,613	\$1,435,941	I. \$54,672

Three months—Jan. 1 to March 31:

	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$13,099,995	\$12,250,992	I. \$849,003
Oper. expenses.....	9,245,178	8,220,543	I. 1,024,635
Net earnings.....	\$3,854,817	\$4,030,449	D. \$175,632

	1888.	1887.	Inc. or Dec.
West. lines def.....	153,295	Sur. 524,423	D. \$175,632
Net earnings.....	\$3,701,522	\$4,554,872	D. \$853,350

The statement of the Northern Central for the month of March and the three months ending March 31 shows the following comparison of the earnings and expenses:

Month of March:	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$420,081	\$314,022	D. \$87,040
Oper. expenses.....	342,630	208,053	I. 44,576
Net earnings.....	\$83,457	\$215,968	D. \$132,517

Three months—Jan. 1 to March 31:

	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$1,333,272	\$1,517,959	D. \$184,686
Oper. expenses.....	974,004	873,919	I. 100,085
Net earnings.....	\$359,268	\$644,040	D. \$284,771

The annual report of the Denver & Rio Grande Western for the year ending Dec. 31, 1887, shows the following results:

	1888.	1887.	Inc. or Dec.
Earnings for freight.....	\$823,514	\$725,554	I. \$97,960
Total gross earnings.....	1,181,325	1,057,093	I. 124,232
Operating expenses.....	839,338	695,994	I. 143,344
Net earnings.....	\$341,987	\$361,099	D. \$19,112

	1888.	1887.	Inc. or Dec.
Per ct. expenses to gr. earnings.....	71.05	65.84	
Per ct. net to gross.....	28.93	34.16	

The statement of the earnings and expenses of the New York, Lake Erie & Western for the month of March and the six months to March 31 is as follows:

Month of March:	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$2,130,419	\$2,121,305	I. \$9,114
Working expenses.....	1,313,002	1,326,495	I. 13,493
Due leased lines.....	\$817,417	\$794,810	I. \$22,607
Net earnings.....	\$639,822	\$619,908	I. \$19,914

Six months—Oct. 1 to March 31:

	1888.	1887.	Inc. or Dec.
Gross earnings.....	\$13,241,935	\$12,820,673	I. \$421,262
Working expenses.....	8,762,520	8,308,786	I. 453,734
Due leased lines.....	\$4,470,415	\$4,511,887	D. \$41,472
Net earnings.....	\$1,008,995	\$1,139,498	D. \$130,503

Two months—Jan. 1 to Feb. 29:

	1888.	1887.	Inc. or Dec.
Mileage.....	3,006	2,446	I. 560
Gross earnings.....	\$2,140,605	\$2,549,053	D. \$408,448
Oper. expenses.....	1,531,084	1,477,863	I. 53,221
Net earnings.....	\$609,521	\$1,071,190	D. \$461,669

The following is the statement of the Atchison, Topeka & Santa Fe for February and the two months of the year.

Month of February:	1888.	1887.	Inc. or Dec.
Mileage.....	4,030	3,146	I. 884
Gross earnings.....	\$1,069,123	\$1,236,462	D. \$167,339
Oper. expenses.....	777,915	748,357	I. 29,558
Net earnings.....	\$291,208	\$488,105	D. \$196,897

Two months—Jan. 1 to Feb. 29:

	1888.	1887.	Inc. or Dec.
Mileage.....	3,006	2,446	I. 560
Gross earnings.....	\$2,140,605	\$2,549,053	D. \$408,448
Oper. expenses.....	1,531,084	1,477,863	I. 53,221
Net earnings.....	\$609,521	\$1,071,190	D. \$461,669

Earnings of railroad lines for various periods are reported as follows:

Month of March:

	1888.	1887.	Inc. or Dec.	P. c.
Allegheny Valley.....	\$159,929	\$173,500	D. \$13,571	7.5
Balt. & Potomac.....	55,281	64,705	D. 9,424	13.9
Cam. & Atl. & Bra.....	120,720	120,555	I. 165	0.1
Cent. of Georgia.....	24,820	45,558	D. 20,738	44.4
Det. B. C. & Al.....	35,432	34,805	D. 627	1.8
Mem. & Charles.....	2,604	1,905	I. 699	32.5
N. Y. L. E. & W.....	552,080	508,235	I. 43,845	8.2
Norfolk & West.....	198,385	197,257	I. 1,128	0.5
Norfolk & West.....	38,757	39,709	D. 952	2.5
Mem. & Charles.....	17,981	24,294	D. 6,313	25.0
N. Y. L. E. & W.....	124,616	127,817	D. 3,201	2.3
Norfolk & West.....	6,388	33,949	D. 27,561	82.2
N. Y. L. E. & W.....	2,130,419	2,121,305	I. 9,114	0.4
Norfolk & West.....	817,417	794,810	I. 22,607	2.8
Norfolk & West.....	416,342	322,461	I. 93,881	29.2
Norfolk & West.....	183,891	135,630	I. 48,261	35.5
Norfolk & West.....	428,081	514,022	D. 85,941	17.1
Norfolk & West.....	83,451	214,250	D. 130,799	60.7
Pennsylvania.....	4,526,561	4,410,433	I. 116,128	2.6
Phila. & Read.....	1,490,613	1,435,941	I. 54,672	3.7
Phila. & Read.....	1,579,308	1,750,584	D. 171,276	10.2
Phila. & Read.....	653,453	928,169	D. 274,716	29.3
Phila. & Read.....	1,078,644	1,283,579	D. 204,935	15.9
Phila. & Read.....	289	42,199	D. 41,910	99.3
Total both co's.....	2,637,932	3,043,165	D. 385,233	12.6
Net earnings.....	653,741	968,367	D. 314,626	32.4
Rich. & W. P. Ter.....	432,016	364,378	I. 67,638	18.4
Rich. & W. P. Ter.....	226,399	194,306	I. 32,093	16.4
Rich. & W. P. Ter.....	133,803	134,764	D. 961	0.7
Rich. & W. P. Ter.....	54,317	54,924	D. 607	1.0
Rich. & W. P. Ter.....	57,960	50,148	I. 7,812	14.0
Rich. & W. P. Ter.....	22,086	17,823	I. 4,263	23.4
Rich. & W. P. Ter.....	83,002	76,365	I. 6,637	7.8
Rich. & W. P. Ter.....	38,502	37,373	I. 1,129	2.7
Rich. & W. P. Ter.....	101,907	100,687	I. 1,220	1.0
Rich. & W. P. Ter.....	36,934	41,687	D. 4,753	9.9
Rich. & W. P. Ter.....	227,983	217,319	I. 10,664	4.5
Rich. & W. P. Ter.....	56,684	41,967	I. 14,717	38.5
Total (gross).....	\$12,223,470	\$12,360,736	D. \$137,266	1.1
Total (net).....	\$4,180,224	\$4,551,447	D. \$371,223	8.1

Three months—Jan. 1 to March 31:

	1888.	1887.	Inc. or Dec.	P. c.
Allegheny Val.....	\$471,335	\$455,250	I. \$16,085	3.5
Balt. & Potomac.....	189,265	154,994	I. 34,271	22.0
Cam. & Atl. & Bra.....	357,167	338,210	I. 18,957	7.5
Cent. of Ga.....	106,373	106,358	I. 15	0.0
Det. B. C. & Al.....	99,707	90,452	I. 9,255	10.0
Mem. & Char.....	15,108	25,526	D. 10,418	22.2
N. Y. L. E. & W.....	1,841,963	1,586,586	I. 255,407	16.1
Norfolk & West.....	703,398	506,590	I. 196,808	24.0
Norfolk & West.....	101,288	90,248	I. 11,040	12.2
Norfolk & West.....	37,111	47,089	D. 9,978	2.1
Norfolk & West.....	427,174	459,438	D. 32,264	4.1
Norfolk & West.....	67,271	113,329	D. 46,058	40.7
N. Y. L. E. & W.....	6,008,882	5,933,030	I. 75,852	2.3
Norfolk & West.....	1,950,049	1,920,596	I. 29,453	1.9
Norfolk & West.....	1,147,911	901,107	I. 246,804	27.3
Norfolk & West.....	471,285	304,463	I. 166,822	29.1
Norfolk & West.....	1,333,273	1,517,960	D. 184,686	12.1
Norfolk & West.....	359,268	640,641	D. 281,372	43.9
Norfolk & West.....	13,099,995	12,250,992	I. 849,003	6.9
Norfolk & West.....	3,854,817	4,030,449	D. 175,632	4.3
Norfolk & West.....	3,615,905	4,848,661	D. 1,232,756	25.5
Norfolk & West.....	1,103,227	2,477,739	D. 1,374,512	55.4
Norfolk & West.....	1,694,915	3,439,350	D. 1,744,435	59.8
Norfolk & West.....	298,841	71,471	I. 227,370	319.7
Rich. & W. P. Ter.....	1,251,480	1,068,878	I. 182,602	17.0
Rich. & W. P. Ter.....	635,220	550,970	I. 84,250	14.0
Rich. & W. P. Ter.....	389,549	348,765	I. 40,784	11.5
Rich. & W. P. Ter.....	142,520	118,931	I. 23,589	19.4
Rich. & W. P. Ter.....	250,894	224,571	I. 26,323	15.6
Rich. & W. P. Ter.....	126,894	118,524	I. 8,370	6.7
Rich. & W. P. Ter.....	185,653	101,404	I. 84,249	14.9
Rich. & W. P. Ter.....	88,279	70,319	I. 17,960	24.3
Rich. & W. P. Ter.....	272,042	255,085	I. 16,957	6.6
Rich. & W. P. Ter.....	61,699	61,531	I. 168	0.7
Rich. & W. P. Ter.....	636,306	591,776	I. 44,530	10.9
Rich. & W. P. Ter.....	149,540	11,292	I. 138,248	1254.4
Total (gross).....	\$33,275,090	\$34,511,263	D. \$1,236,173	3.6
Total (net).....	10,372,505	11,459,672	D. 1,087,167	9.5

Month of February:

	1888.	1887.	Inc. or Dec.	P. c.
Atch. & S. F.....	\$1,099,123	\$1,236,463	D. \$137,340	13.5
Den. & R. G.....	291,208	490,105	D. 198,897	40.5
Den. & R. G.....	514,701	552,284	D. 37,583	6.7
Den. & R. G.....	109,866	220,559	D. 110,693	5